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PHOTOGRAPHS AND DESCRIPTIONS OF CUP-FUNGI—VII.¹ THE GENUS UNDERWOODIA

FRED J. SEAVER

(WITH PLATE 1)

The above genus was founded by Peck on three plants collected by J. T. Fischer at Kirkville, New York, July, 1889. As indicated by the author of the genus in connection with his original description, the three plants were split lengthwise and a half of each sent to him by Professor Underwood to whom the genus was dedicated. The other half of each plant was retained and eventually deposited in the herbarium of the New York Botanical Garden. A note by Underwood accompanying these specimens states, "The locality has been carefully searched every year from 1889 to 1895 with the above results." The results consisted of one specimen collected by Underwood in June, 1890, from which the accompanying photograph and drawings have been made; also fragments of a specimen collected by Underwood in June, 1893, making in all three collections of the species including the type.

On July 23, 1917, Mr. Stewart H. Burnham sent from Hudson Falls, New York, two small specimens of the species collected at Tripoli, New York, and determined by himself. This is the extent of our knowledge of the species so far as our own collections are concerned. While it is impossible to know how many

¹ An error occurred in the numbering of the last paper under this main title in MYCOLOGIA for March, 1917. It should have been numbered VI instead of V. The species illustrated was *Discina venosa*.

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times the species has been picked up, from the records and specimens seen it appears to be a very rare fungus and it is hoped that the publication of the illustration and description at this time may result in bringing to light other specimens which may have been collected in this or other states.

Peck in describing the plant states: "It is as if the stem of *Helvella crispa* should be deprived of its pileus and entirely covered with an adnate hymenium, thus becoming a stemless receptacle." Sections of the stem show it to be porous, the pores consisting of longitudinal cavities separated by partitions as indicated in the accompanying drawing.

Schroeter has placed this genus in the Rhizinaceae but as indicated by Underwood it belongs more properly with the Helvellaceae. While from its general form it would seem to be out of place among the cup-fungi, in a general way the Helvellaceae are included with this group in spite of their irregularity in form.

The genus appears to be well marked and stands as an excellent memorial to the man who has done so much to stimulate an interest in North American mycology.

UNDERWOODIA Peck, Ann. Rep. N. Y. State Mus. 43: 78. 1890

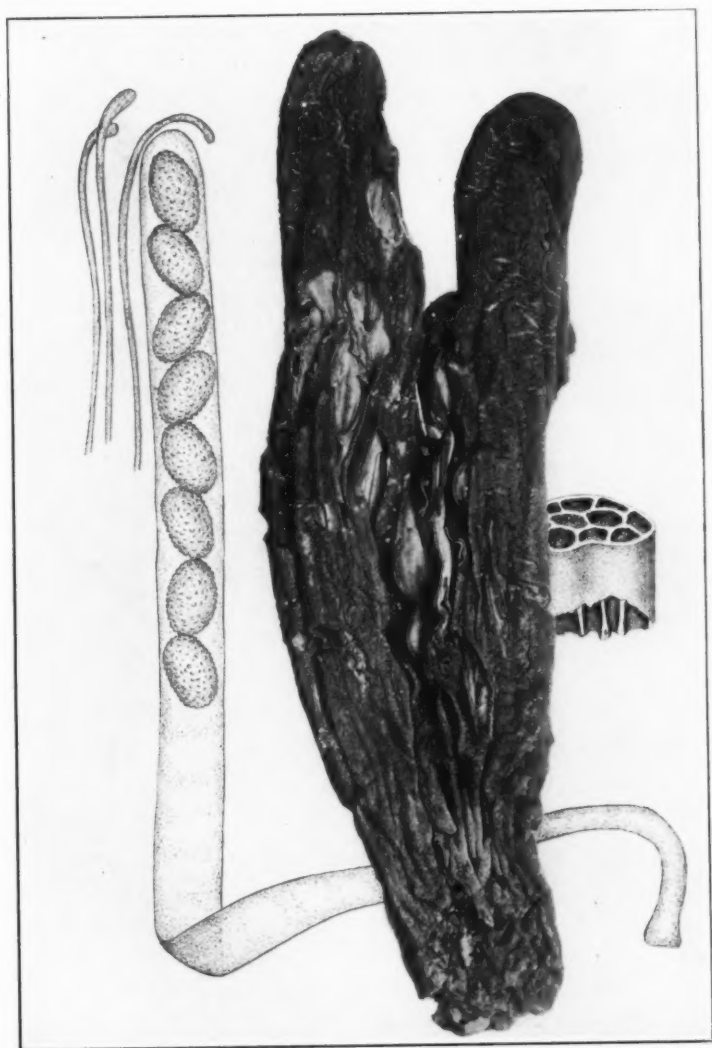
Pileus fleshy, more or less elongated or columnar, entirely covering the stem; hymenium covering the entire outer surface of the pileus, even or undulated; stem externally lacunose and internally containing several longitudinal cavities; asci cylindric above, 8-spored; paraphyses slender below, clavate above.

Type species, *Underwoodia columnaris* Peck.

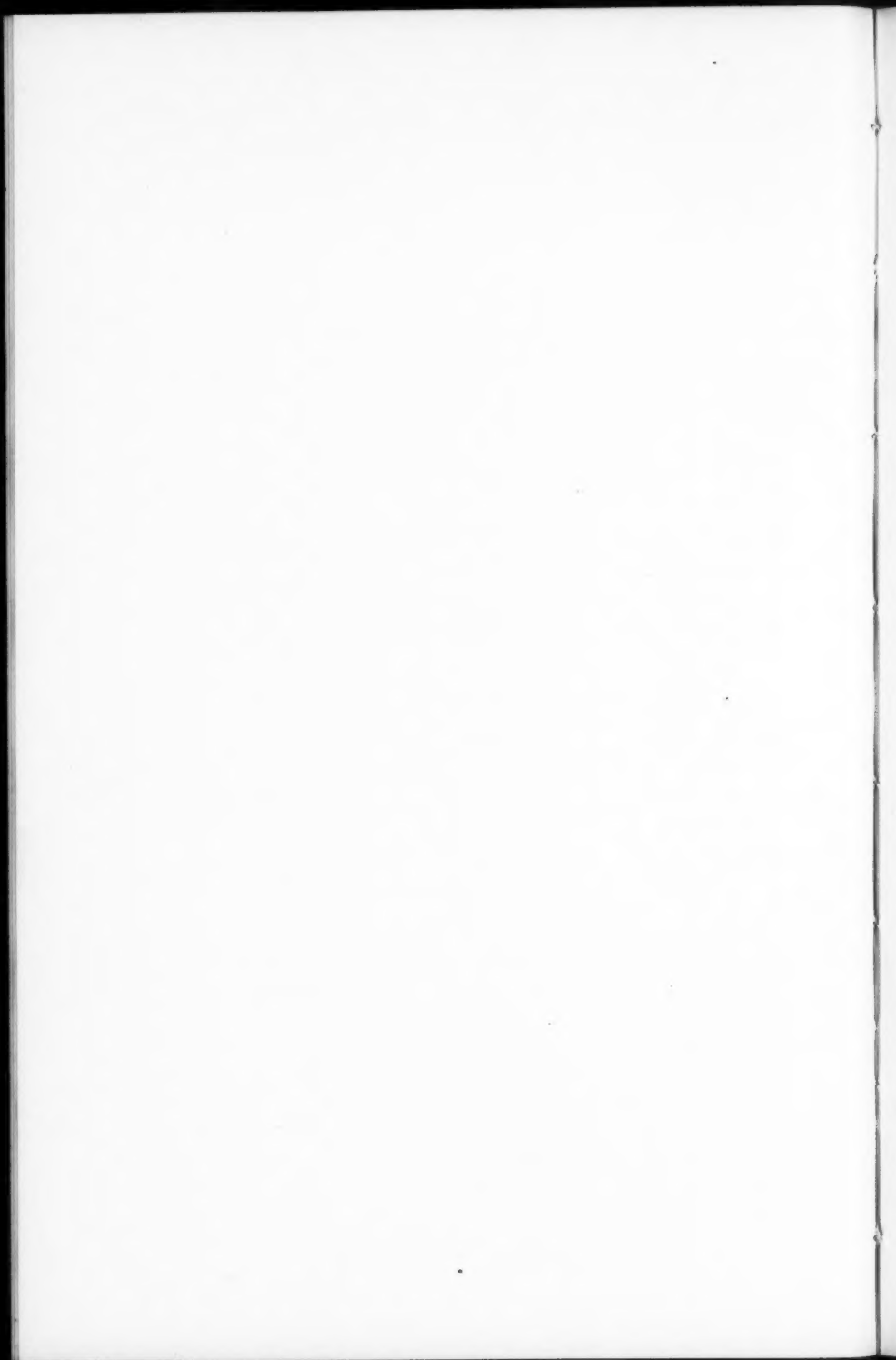
UNDERWOODIA COLUMNARIS Peck, Ann. Rep. N. Y. State Mus.

43: 78. 1890

Pileus clavate, columnar or slightly tapering above, straight or curved and often horn-shaped, entirely overspreading the stem; at first light-colored, becoming brownish; the entire fruiting body appearing like the stem of a *Helvella* entirely overspread with the pileus, reaching a height of 10 cm. and a diameter of 2-3 cm.; asci reaching a length of 350 μ and a diameter of 20 μ , tapering below into a stem-like base with a rather abrupt enlargement at the extreme base; spores 1-seriate or occasionally slightly



UNDERWOODIA COLUMNARIS PECK



crowded, ellipsoid, at first smooth, becoming sculptured, $12-14 \times 25-27 \mu$; spore-sculpturing taking the form of rather coarse warts or small tubercles; paraphyses rather strongly thickened, brownish.

On soil among leaves.

TYPE LOCALITY: Kirkville, New York.

DISTRIBUTION: New York.

ILLUSTRATIONS: Ann. Rep. N. Y. State Mus. 43: *pl. 4, f. 1-4*.

NEW YORK BOTANICAL GARDEN.

NOTES ON THE ALTITUDINAL RANGE OF FOREST FUNGI

JAMES R. WEIR

The altitudinal range of forest tree fungi is a subject of some interest to foresters, and one seldom touched upon in forest pathological reports. During the seasons from 1912 to 1915 the writer, in connection with other work in the higher elevations of the Pacific Northwest, gathered considerable information on this subject.

VEGETATION OF REGIONS VISITED

In most of the higher mountains in Washington, Oregon, Idaho, and Montana arctic conditions prevail during a part of the year. This is indicated by the occurrence of such heather-like plants as *Phyllodoce empetriformis* (Smith) Don, *Ledum glandulosum* Nutt., *Vaccinium microphyllum* Ryd., *Rhododendron albi-florum* Hook., *Gaultheria humifusa* (Graham) Ryd., *Cassiope mertensiana* (Bong.) Don, and by the alpine character of numerous herbaceous plants. On a few of the higher peaks arctic conditions exist for the entire year. The absence on many slopes of a suitable amount of soil capable of supporting any great amount of vegetation is probably more responsible for their alpine character than elevation and exposure. The regions visited do, however, represent the highest of the timbered plant zones for the Northwest.

The characteristic tree which lends the true alpine character to all high elevations in the Northwest is the alpine fir (*Abies lasiocarpa* (Hook.) Nutt.). It is usually associated with the mountain or black hemlock (*Tsuga mertensiana* (Bong.) Carr.) This hemlock is not, however, universally distributed as is the alpine fir but occurs sparingly in certain regions. A tree that reaches the highest elevations and is quite generally mixed with the alpine fir is the white bark pine (*Pinus albicaulis* Engelm.).

The limber pine (*Pinus flexilis* James) is also a timber line tree in several regions visited, as is also the alpine larch (*Larix lyallii* Parl.). Other trees reaching well up into the subalpine zone are lodgepole pine (*Pinus contorta* Loud.), Engelmann spruce (*Picea engelmanni* Engelm.), and Douglas fir (*Pseudotsuga taxifolia* (Lam.) Britton), the latter often assuming most peculiar and grotesque shapes.

Although most of the higher elevations visited represent the timber line for the region, the fungi collected would be found at a much greater elevation farther south, since the altitude of the timber line varies with the latitude in that direction while the reverse is true to the northward. Specimens of forest tree fungi at hand from some of the mountain ranges to the south and from northern Alaska show this to be true.

FACTORS GOVERNING THE ALTITUDINAL RANGE OF FOREST FUNGI

In the course of the collection of fungi on high mountains many points of interest have been recorded. Certain species disappear with increasing elevation, some are chiefly associated with particular forest zones, while others are more cosmopolitan and are found in greater or less quantity at all elevations. Some species always occur in greater or less quantity under all conditions provided their hosts are present. For example, *Fomes pini* (Brot.) Lloyd and *Echinodontium tinctorium* E. & E. are always found to accompany their respective hosts to the absolute timber line. Both species primarily belong to the lower forest zones. Tubeuf¹ reports the occurrence of *Fomes pini* on *Pinus cembra* in the Bavarian Highlands at an elevation of 1700 m. (5610 feet).

In ascending a high mountain it is soon noticed that the number of fungous species, likewise their abundance, decreases with increasing elevation. Barring the demands on moisture this seems to be due to the influence of temperature. It is known that there is a particular optimum temperature for spore germination about which many species seem to oscillate. This may vary from the temperature at which the best mycelial growth of the

¹Tubeuf, C. v. Notizen über die Vertikalverbreitung der *Trametes pini* und ihr Vorkommen an Verschiedenen Holzarten. Naturw. Zeitschr. f. Land- u. Forstw. 4: pp. 96-100.

same species occurs. Since in most cases new infections must originate from the spore, a species may be confined to that elevation and to those conditions of exposure where the most favorable temperature for spore germination exists for the greatest length of time. After becoming thoroughly established in the substratum the effect of this influence may not be so marked. A higher or lower temperature may then only serve to retard the activity of the mycelium and not endangered its existence. Some fungi, in fact, are truly alpine in habit and are not usually found growing below a certain elevation and will die if transferred to lower altitudes. This fact can be demonstrated experimentally as the following data will show.

By carefully transplanting (July 3, 1913) three seedlings each of alpine fir and white bark pine infected with *Herpotrichia nigra* Hartig and *Neopectia coulteri* (Pk.) Sacc., respectively, from an elevation of 6735 feet (2052.8 m.) into lowland of 2500 feet (762 m.), the mycelia of these fungi after making an average growth of eight centimeters ceased altogether in August of the following year or thirteen months after the transfer. Both species died shortly afterward. The hosts continued to live. This result, though based on a single experiment, indicates that an average low temperature may be necessary for the development of these species.²

The coldest weather anywhere in the Northwest at any elevation is not sufficient to destroy the vitality of the sporophores of the common forest tree fungi. On the return of normal growing conditions, even though this period is short, all vital functions are resumed. The minimum temperature at which the sporophores of the common species are capable of withstanding is extremely low. Buller³ has demonstrated "that the fruiting bodies of

² An interesting fact brought out by this experiment was that the spores of each species produced in perithecia developed while in the new habitat did not undergo any change in color, shape, dimension, number of septa, or arrangement in the ascus different from the usual type of spore which has always characterized these plants as two distinct species.

³ Upon the retention of vitality by dried fruiting bodies of certain Hymenomycetes including an account of an experiment with liquid air. Trans. of the British Mycological Society. 1912. P. 112.

Also Buller and Cameron. On the temporary suspension of vitality in the

Schizophyllum commune, after having been kept dry and exposed to the air for two years and eight months, are able to retain their vitality when subsequently they have been dried *in vacuo* by the phosphorus pentoxide and charcoal-bulb liquid air method and subjected to the temperature of liquid air (-190° C.) for three weeks." This shows the wonderful powers of resistance against drought and cold by this species. The same author demonstrated that a number of the sporophores of the common wood-destroying fungi have the ability to withstand very low temperatures. It is interesting to note in the list at the end of this article that the xerophilous species are well represented in high altitudes.

With regard to the form and general development of the aerial parts of the larger fungi in high mountains, there are many analogies with the higher plants. Some species have developed special structures in order the better to withstand the drying winds of high elevations. *Polyporus leucospongia* Cke. is a notable example of this. It has been observed that the spongy layer of the sporophore retains moisture for a considerable period following a rain. This aids in keeping the sporophore moist and furthers its development. Perennial polypores under alpine conditions are usually distinguished from the same species in the lowlands by their small size, different color, inclination to the resupinate form, and a hard context. The sporophores of *Fomes pini* at high elevations are small and either appear just under branches or in a poria-like form in the clefts of the bark. Fungi in well protected sites as compared to those in the arid wind-swept areas are larger and there is a greater variety and number of species. Up to an elevation of about 4000 feet (1219 m.) there is practically no difference in the position or location on their substrata of the wood-destroying fungi. Sporophores occur quite promiscuously on fallen trunks or high up on standing trees. At 4000 to 5000 feet elevation the sporophores of *Echinodontium tinctorium* and *Fomes pini* may occur as high up on their hosts as in the lowlands depending upon the height, size, and age of the trees. With increasing elevation the sporophores fruit bodies of certain Hymenomycetes. Trans. of the Royal Soc. of Canada. Third series. 6: pp. 73-75. 1912.

of these and other species growing on standing trees are usually found nearer the earth.

It is very evident that the occurrence of fungi, particularly the fleshy species, in elevated regions is closely correlated with the ratios of evaporation and precipitation. The excessive precipitation in the form of rain and snow is counteracted by the rapid evaporation from all substrata except in the more protected places or on north slopes. The influence of topography in this respect tends to produce a wide variation in the fungous flora in very narrow confines. Rounded peaks have many exposures. Consequently, fungous associations on the same mountain may be widely different. Though trees may be present on exposed wind-swept sites, all classes of fungi except a few perennials or species with special adaptation are usually absent. Those that do occur on such sites, if not found to be entirely different species from those occurring in protected exposures where the snow collects, are often so modified that they could well be classed as biological forms. Some of the fungi usually characterizing exposed sites are *Lentinus lepideus* Fr., *Lenzites sepiaria* (Wulf.) Fr., *Poly-stictus hirsutus* Fr., *Polyporus leucospongia* Cke., and certain *Patellea* species. The greater amount of snow on protected sites prevents the radiation of heat from the substrata, hence prevents evaporation and desiccation and usually promotes the development of certain fungi, particularly the more fleshy wood-destroying species. On the other hand, annual sporophores may be entirely absent under the more extreme conditions owing to the fact that snow shortens the period of vegetative growth or the weight and movement of snow is too great to be sustained.

Any factor that influences the cellular and chemical development of the wood of a tree may influence the growth of some wood-destroying fungi, hence their distribution. Aside from the moisture relation which is always a factor in promoting the growth of fungi, the influence of elevation on the chemical and anatomical structure of forest trees is a well known phenomenon and in a measure determines their predisposition to disease. According to Weber⁴ the organic content of larches and beeches

⁴ Einfluss des Standortes auf die Zusammensetzung der Asche von Lärchen. Allgem. Forst- u. Jagdzeitung. P. 367. 1873.

regularly increases with increase in elevation with exactly the reverse for the mineral substances. With increasing elevation, certain anatomical changes in forest trees such as narrower rings imparting a hard flinty condition to the heartwood,⁵ tend to reduce their disposition to disease. The influence of high mountain conditions on the prevalence of fungi is more noticeable in the case of leaf and twig diseases because of certain modifications of the host which makes attack by parasites difficult. The foliage of forest trees and other plants at high elevations is usually greatly modified to withstand arid conditions. This modification is generally expressed by a thicker epidermis, excessive development of hairs and waxy coverings and, no doubt, retards and in many cases absolutely prevents infection. Very few endophytic leaf parasites have been collected at high elevations. On the other hand, epiphytic species are more common. With the reverse of these conditions in the lowlands the same species may be and usually are more seriously attacked by fungi. The difficulty experienced in the cultivation of the larch in the lowlands of Germany owing to the increased destructiveness of *Dasyscypha Willkommii* Hartig is a case in point.

Any forest tree with a great altitudinal range is more severely attacked by fungi at its lowest elevation. As examples, grand fir (*Abies grandis* Lindl.), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), and alpine fir, particularly show this to be true. The problems of management with regard to forest tree diseases in the highest elevations at which merchantable forests can be grown will never be as difficult as at lower levels. The fact that the tree species will be more or less separated into their component types will not at this elevation be as serious a factor in promoting the spread of fungous diseases as at lower elevations. The big problem at low elevations in reducing the ravages of fungi is to find the environment best suited for the several species

Einfluss des Standortes auf den Aschengehalt des Buchenlaubes. Allgem. Forst- u. Jagdzeitung. P. 221. 1875.

Also Cieslar, A. Über den Ligningehalt einiger Nadelhölzer. Mitt. a. d. Forst. Versuchswesen Oesterreichs. v. 23: 1897.

⁵ Rosenthal, M. Über die Ausbildung der Jahresringe an der Grenze des Baumwuchses in den Alpen. Cit. Bot. Centralbl. nr. 43. 1904. Sendtner, Vegetationswerk. Sudbayerns. P. 555.

at that elevation. Trees growing in an unfavorable environment are invariably more seriously diseased. To attempt the development of a pure larch forest on low undrained soil is to give it over to serious decay.

Until the time comes to practice silviculture in the higher elevations the search for the greatest altitudinal range for our common forest fungi is chiefly of mycological interest. Recent studies show that many of the species found at all elevations are of greatest economic importance at particular elevations and in particular forest zones as influenced by physical environment. It is entirely possible in restricted areas to group the forest fungi of greatest economic importance with regard to amount of damage done according to the different forest zones. For example, in northern Idaho, *Fomes pini*, *Polyporus schweinitzii*, *Fomes annosus*, *Echinodontium tinctorium*, *Armillaria mellea* are of far greater importance in point of damage done in the white pine zone than in any other. The problem then is to search out the factors which govern the prevalence and distribution of fungi in the several forest types and balance them in such a way as to produce the best possible results in tree growth.

FUNGI COLLECTED AT HIGH ELEVATIONS

The following is a list of fungi either collected or observed at high elevations in the principal mountain regions of the Northwest between 44° to 49° latitude and 109° to 124° longitude. From the fact that most of the common genera are represented, a special and detailed search at different seasons would, no doubt, reveal a far greater number of species than here recorded. The species here listed with the exception of those entirely confined to high elevations have not been found in abundance but occur only occasionally. Although numbered among them are many of the most destructive species of lower forest zones, they have not been found to cause any great damage to forest growth at high elevations over large areas. It is proposed to add to this list as the explorations continue.

TABLE I.—*Showing the Highest Elevation at Which Some Common Forest Fungi have been Found, Giving Host, Mountain Range, and Peak where Observation was Made*

(Region between 44° and 49° latitude and 109° and 124° longitude)

Name of fungus	Host	Mountain range and peak	Elevation	
			Feet	Meters
<i>Armillaria mellea</i> (Vahl.) Quel.	<i>Abies lasiocarpa</i>	Selkirks; Mt. Casey	6735	2052
<i>Calyptospora columnaris</i> (A. & S.) Kuhn.	<i>Vaccinium microphyllum</i>	Selkirks; Smith Peak	5650	1722
<i>Chlorosplenium aeruginosum</i> Fr.	Fallen twigs	Selkirks; Mt. Casey	6735	2052
<i>Corticium lividum</i> Pers.	<i>Picea engelmanni</i>	" " "	6735	2052
<i>Corticium laetum</i> Karst.	<i>Alnus tenuifolia</i>	" " "	6735	2052
<i>Corticium corrugé</i> Burt.	<i>Abies lasiocarpa</i>	St. Joe Mts.; Marble Mt.	6580	2005
<i>Coleosporium solidaginis</i> (Schw.) Thum.	<i>Aster cusickii</i>	Blue Mts.; Huckleberry Mt.	4911	1496
<i>Coniophora arida</i> Fr.	<i>Picea engelmanni</i>	Selkirks; Smith Peak	6000	1828
<i>Cronartium comandrae</i> Pk.	<i>Comandra pallida</i>	Bitter Root Mts.; Mt. Sentinel	5801	1768
<i>Cytospora translucens</i> Sacc.	<i>Salix</i> sp.	Selkirks; Smith Peak	7650	2331
<i>Dacryomyces aurantia</i> Schw.	<i>Pseudotsuga taxifolia</i>	" " "	4650	1417
<i>Daedalea unicolor</i> Bull.	<i>Alnus tenuifolia</i>	" " "	4650	1417
<i>Daldinia concentrica</i> Bolt.	<i>Alnus tenuifolia</i>	" " "	4650	1417
<i>Diatrype bullata</i> (Hoff.) Fr.		" " "	7650	2331
<i>Echinodontium tinctorium</i> E. & E.	<i>Abies lasiocarpa</i>	Cascades; Mt. Baker	7500	2286
<i>Echinodontium tinctorium</i> E. & E.	" "	Selkirks; Smith Peak	7450	2270
<i>Echinodontium tinctorium</i> E. & E.	<i>Abies concolor</i>	Blue Mts.; Huckleberry Mt.	5000	1524
<i>Echinodontium tinctorium</i> E. & E.	<i>Abies grandis</i>	Cabinet; Scotchman Peak	5250	1600
<i>Exidia glandulosa</i> Bull.	<i>Salix</i> sp.	Selkirks; Smith Peak	4200	1280
<i>Exobasidium vaccinii</i> (Fckl.) Wor.	<i>Vaccinium membranaceum</i>	Selkirks; Bald Mt.	4000	1219
<i>Exobasidium vaccinii</i> (Fckl.) Wor.	<i>Vaccinium microphyllum</i>	Selkirks; Smith Peak	7650	2331
<i>Fomes annosus</i> Fr.	<i>Pinus albicaulis</i>	" " "	7420	2260
<i>Fomes ignarius</i> Lin.	<i>Alnus tenuifolia</i>	" " "	7420	2260
<i>Fomes officinalis</i> Fr.	<i>Pseudotsuga taxifolia</i>	Selkirks; Mt. Casey	6735	2052
<i>Fomes pini</i> Brot.	<i>Pinus albicaulis</i>	" " "	6735	2052
" " "	" "	Cascades; Mt. Baker	7500	2286
" " "	<i>Pinus contorta</i>	Selkirks; Mt. Casey	6735	2052
" " "	<i>Abies lasiocarpa</i>	Continental Divide; Mudd Creek	7250-2209	
<i>Fomes pinicola</i> Swartz	<i>Pinus albicaulis</i>	Selkirks; Mt. Casey	6735	2052
" " "	" "	Cascades; Mt. Baker	7600	2316
" " "	<i>Pinus flexilis</i>	Continental Divide; Mt. Haggin	8500	2590

TABLE I.—(Continued.)

Name of fungus	Host	Mountain range and peak	Elevation	
			Feet	Meters
<i>Grandinia granulosa</i> Pers.	<i>Larix lyallii</i>	Continental Divide; Mt. Haggin	8500	2590
<i>Geaster hygrometricus</i> Pers.	Well submerged in soil	Cascades; Mt. Baker	7000	2133
<i>Herpotrichia nigra</i> Hartig	<i>Tsuga mertensiana</i>	St. Joe Mts.; Marble Pk.	6580	2005
<i>Herpotrichia nigra</i> Hartig	<i>Picea engelmanni</i>	Continental Divide; Mt. Haggin	7500	2286
<i>Herpotrichia nigra</i> Hartig	<i>Abies lasiocarpa</i>	Bitter Root Mts.; Tiger Peak	6635	2022
<i>Herpotrichia nigra</i> Hartig	" "	Selkirks; Mt. Casey	6735	2052
<i>Hirneola auricula-Judae</i> Lim.	" "	Cascades; Mt. Baker	6500	1981
<i>Hymenochaete tabacina</i> Sow.	<i>Alnus tenuifolia</i>	Selkirks; Mt. Casey	6700	2042
<i>Hymenochaete corrugata</i> Lev.	" "	" " "	6700	2042
<i>Irpex lacteus</i> Fr.	" "	Selkirks; Bald Mt.	6228	1898
<i>Lachnella</i> sp.	<i>Picea engelmanni</i>	" " "	5228	1593
<i>Lenzinus lepideus</i> Fr.	<i>Abies lasiocarpa</i>	Selkirks; Mt. Casey	6735	2052
<i>Lenzites sepiaria</i> Fr.	<i>Pinus albicaulis</i>	Cascades; Mt. Baker	7500	2286
<i>Lophodermium pinastri</i> Schrad.	<i>Pinus monticola</i>	St. Joe Mts.; Marble Mt.	5000	1524
<i>Melampsora bigelowii</i> Thum.	<i>Salix</i> sp.	Selkirks; Smith Peak	5600	1706
<i>Microsphaera diffusa</i> C. & P.	<i>Ledum glandulosum</i>	Cascades; Mt. Baker	5000	1524
<i>Merulius aureus</i> Fr.	<i>Pinus contorta</i>	Selkirks; Mt. Casey	6735	2052
<i>Merulius neveuus</i> Fr.	<i>Alnus tenuifolia</i>	" " "	6735	2052
<i>Neopeckia coulteri</i> (Pk.) Sacc.	<i>Pinus contorta</i>	Continental Divide; Mt. Haggin	8000	2438
<i>Neopeckia coulteri</i> (Pk.) Sacc.	<i>Pinus albicaulis</i>	Cascades; Mt. Baker	7500	2286
<i>Neopeckia coulteri</i> (Pk.) Sacc.	<i>Pinus flexilis</i>	Continental Divide; Mt. Haggin	8000	2438
<i>Patella</i> sp.	On wind eroded wood	Cabinet; Scotchman Peak	7011	2136
<i>Peniophora crassa</i> Burt	<i>Picea engelmanni</i>	Selkirks; Smith Peak	6200	1834
<i>Peniophora globifera</i> E. & E.	" "	" " "	6200	1834
<i>Peniophora carnosa</i> Burt	<i>Abies lasiocarpa</i>	St. Joe Mts.; Monumentals	6500	1981
<i>Peridermium coloradense</i> (Diet.) Arth. & Kern.	<i>Picea engelmanni</i>	Selkirks; Bald Mt.	5100	1554
<i>Peridermium balsameum</i> Pk.	<i>Abies lasiocarpa</i>	Cascades; Mt. Baker	6000	1828
<i>Phlebia cinnabarina</i> Schw.	<i>Alnus tenuifolia</i>	Cabinet; Scotchman Peak	7000	2133
<i>Phragmidium occidentale</i> Arth.	<i>Rubus nutkana</i>	Selkirks; Mt. Casey	6300	1920
<i>Phragmidium Rosae-acicularis</i> Liro	<i>Rosa sayi</i>	" " "	5000	1524

TABLE I.—(Continued.)

Name of fungus	Host	Mountain range and peak	Elevation	
			Feet	Me- ters
Phyllactinia corylea (Pers.) Karst.	Alnus tenuifolia	Bitter Root Mts.; Grizzly Peak	5977	1821
Polyporus amorphus Fr.	Picea engelmanni	Selkirks; Mt. Casey	6000	1828
Polyporus alboluteus Ellis	Larix lyallii	Bitter Root Mts.; Shattuck Mt.	7580	2310
Polyporus benzoinus Fr.	Tsuga mertensiana	St. Joe Mts.; Monu- mentals	6900	2103
Polyporus lucidus Leysser	" "	St. Joe Mts.; Marble Mt.	6000	1828
Polyporus picipes Fr.	Alnus sp.	Cascades; Mt. Baker	7000	2133
Polyporus leucospongia Cke.	Pinus contorta	St. Joe Mts.; Monu- mentals	6979	2127
Polyporus perennis L.	Ground	Continental Divide; Mt. Haggin	8500	2590
Polyporus tomentosus Fr.	"	Blue Mts.; Rock Creek Butte	8000	2438
Polyporus schweinitzii Fr.	Pseudotsuga taxifolia	Selkirks; Mt. Casey	6735	2052
Polyporus schweinitzii Fr.	Pinus albicaulis	Continental Divide; Sullivan Peak	8150	2484
Polystictus abietinus Dicks.	" "	Continental Divide; Mt. Haggin	8500	2590
Polystictus hirsutus Fr.	Alnus tenuifolia	Selkirks; Smith Peak	7650	2331
Polystictus versicolor L.	Pinus albicaulis	Selkirks; Smith Peak	7650	2331
" " "	Abies lasiocarpa	Cascades; Mt. Baker	7600	2316
Poria attenuata Pk.	Tsuga mertensiana	St. Joe Mts.; Marble Mt.	6580	2005
Puccinia calthae Lk.	Caltha biflora	Cascades; Mt. Baker	8000	2438
Pucciniastrum myrtilli (Schum.) Arth.	Vaccinium micro- phyllum	Blue Mts.; Huckle- berry Mt.	4911	1496
Pucciniastrum pustula- tum (Pers.) Diet.	Epilobium alpinum	St. Joe Mts.; Monu- mentals	4979	1517
Rhytisma arbuti Phill.	Menziesia sp.	Cascades; Mt. Baker	7600	2316
Scleroderma cepa	Embedded in earth	St. Joe Mts.; Monu- mentals	6979	2127
Solenia sp.	Betula glandulosa	Selkirks; Smith Peak	7000	2133
Stereum ambiguum	Abies lasiocarpa	" " "	7650	2331
Stereum fasciatum	Alnus tenuifolia	" " "	7650	2331
Stereum sanguinolent- um A. & S.	Tsuga mertensiana	St. Joe Mts.; Marble Mt.	6580	2005
Stereum sulcatum Burt	Picea engelmanni	Selkirks; Smith Peak	6325	1927
Trametes carnea Nees	Pinus contorta	Selkirks; Mt. Casey	6735	2052
Trametes heteromorpha	Abies lasiocarpa	Continental Divide; Mt. Haggin	8000	2438
Trametes serialis Fr.	Pinus contorta	Continental Divide; Mt. Haggin	9988	3044
Trametes setosus Weir	" "	Continental Divide; Mt. Haggin	8000	2438
Uredinopsis Pteridis Diet. & Holw.	Pteridium aquilinum pubescens	Selkirks; Mt. Casey	5735	1748
Uredo holwayi Arth.	Tsuga mertensiana	St. Joe Mts.; Monu- mentals	4900	1493
Uropyxis sanguinea Pk. & Arth.	Berberis aquifolium	Selkirks; Mt. Casey	5735	1748

SUMMARY

Most forest fungi have a great altitudinal range, being found from sea level to the extreme limits of the timbered zones.

Most of the common forest fungi are found at the highest timbered zones but are not so abundant as at lower elevations.

Certain of the more economic species predominate in particular forest zones or types.

Some species are strictly alpine in habit and are not found below certain elevations and exhibit particular adaptation to their environment.

With increasing elevation the sporophores of certain fungi predominating in lower forest zones exhibit many changes in form, structure, and in mode and place of attachment. The great variation in the temperature and moisture relation induced by the diversity of high mountain regions may greatly influence the development of the aerial parts of wood-destroying fungi but may not materially influence their development within the substratum.

The influence of high mountain conditions on the form and structure of host plants in turn influence the growth of their fungous parasites.

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THE AGARICACEAE OF TROPICAL NORTH AMERICA—VII

WILLIAM A. MURRILL

The last article of this series, concluding a partial treatment of the rusty-spored species, appeared in *Mycologia* for January, 1913. Since that time, the entire group of Pholiotanae has been taken up in *North American Flora*, volume 10, part 3, for the temperate as well as the tropical regions of North America, and the various rusty-spored genera have been treated in their proper order as far as *Inocybe*, which genus will, with *Pholiota*, *Cortinarius*, and *Locellina*, be considered in forthcoming parts of that work.

The next and last subtribe of the Agariceae is now to be considered, at least so far as our tropical species are concerned. The following key includes all the genera in this subtribe, some of which are not represented in tropical America, but another article will be required to complete the treatment of the species.

SUBTRIBE 4. AGARICANAE

Hymenophore dimidiate, sessile or with short, lateral stipe.

1. MELANOTUS.

Hymenophore circular, with central stipe.

Volva absent.

Lamellae not deliquescent.

Stipe slender, tubular, with a cartilaginous cortex; annulus absent except rarely in *Campanularius*.

Lamellae decurrent.

2. DECONICA.

Lamellae adnate or adnexed.

Margin of pileus at first straight and appressed to the stipe.

Spores purplish-brown or dark-fuscous.

3. ATYLOSPORA.

Spores black.

4. PSATHYRELLA.

Margin of pileus at first incurved.

Spores purplish-brown or dark-fuscous.

5. PSILOCYBE.

- | | |
|---|-------------------|
| Spores black. | 6. CAMPANULARIUS. |
| Stipe fleshy or fibrous, of uniform texture. | |
| Veil absent, inconspicuous, or appendiculate, not forming an annulus. | |
| Lamellae adnate or adnexed. | |
| Hymenophore solitary or subcespitate, rarely densely cespitose; hygrophaneous, viscid, or squamulose. | 7. DROSOPHILA. |
| Hymenophore densely cespitose; surface firm, dry, glabrous. | 8. HYPHOLOMA. |
| Lamellae free. | 9. PILOSACE. |
| Veil conspicuous, forming an annulus. | |
| Lamellae decurrent, waxy; veil glutinous; spores black. | 10. GOMPHIDIUS. |
| Lamellae not as above. | |
| Lamellae adnate or adnexed. | 11. STROPHARIA. |
| Lamellae free. | 12. AGARICUS. |
| Lamellae deliquescent, melting to an inky fluid. | 13. COPRINUS. |
| Volva present. | 14. CLARKEINDA. |

I. MELANOTUS Pat. Tax. Hymén. 175. 1900

According to Patouillard, this genus corresponds to *Crepidotus*, of the rusty-spored series, but differs in having spores that are purplish-brown, with an apical pore.

Pileus about 1 cm. broad.

1. *M. musicola*.

Pileus 2-3 cm. broad.

2. *M. fumosifolius*.

1. *Melanotus musicola* (Berk. & Curt.)

Crepidotus musicola Sacc. Syll. Fung. 5: 883. 1887.

Described from Wright's collections on dead plantain leaves in Cuba. Specimens from Guadeloupe and St. Vincent determined as *Crepidotus alveolus* at Kew may belong here or with *Melanotus fumosifolius*.

2. *Melanotus fumosifolius* (Murrill)

Crepidotus fumosifolius Murrill. N. Am. Flora 10: 156. 1917.

Described from specimens collected by Earle on a dead log at Rose Hill, Jamaica. It is common also on dead banana leaves. The spores are broadly ovoid, smooth, decidedly purplish-brown, $5-7 \times 3.5-5 \mu$.

Santiago de las Vegas, Cuba, *Earle* 32, 48; Utuado, Porto Rico, *Mrs. Britton & Miss Marble* 1210; Castleton Gardens, Jamaica, *Murrill* 131; Mooretown, Jamaica, *Murrill* 137, 157; Sir John Peak, Jamaica, *Murrill* 798; British Honduras, *Peck*; Jalapa, Mexico, *Murrill* 97; Orizaba, Mexico, *Murrill* 850; Motzorongo, Mexico, *Murrill* 1060; Xuchiles, Mexico, *Murrill* 1129.

2. DECONICA (W. G. Sm.) Sacc. Syll. Fung. 5: 1058. 1887

This is a very small genus, separated from *Psilocybe* as a subgenus by W. G. Smith in 1870, because of its decurrent lamellae, and raised to generic rank by Saccardo in 1887. There are only two tropical North American species, both occurring on manure.

Pileus 2 cm. broad; spores 12 μ long.
Pileus 0.5 cm. broad; spores 7 μ long.

1. *D. bullacea*.
2. *D. scatigena*.

1. DECONICA BULLACEA (Bull.) Sacc. Syll. Fung. 5: 1058. 1887
Agaricus bullaceus Bull. Herb. Fr. pl. 566, f. 2; hyponym. 1791;
Pers. Syn. Fung. 412. 1801.

This species was first figured by Bulliard from specimens collected in France. While probably widely distributed, it has not often been reported from this country. The spores of excellent specimens collected in Jamaica are ovoid, smooth, opaque, umbrinous by transmitted light under the microscope, 11-12 \times 6-8 μ . Authentic specimens from Bresadola agree in every particular. The following collections were all made on horse manure in pastures and roads.

Jalapa, Mexico, *W. A. & Edna L. Murrill* 29; Cordoba, Mexico, *W. A. & Edna L. Murrill* 887; Santiago de las Vegas, Cuba, *Earle* 62, 84; Halls Delight, Jamaica, *Earle* 117; Cinchona, Jamaica, *W. A. & Edna L. Murrill* 508, 531; Grenada, *Broadway*.

2. DECONICA SCATIGENA (Berk. & Curt.) Sacc. Syll. Fung. 5: 1058. 1887

Agaricus scatigenus Berk. & Curt. Jour. Linn. Soc. 10: 292. 1868.

Known only from Wright's collections in Cuba. The species, which has the same habitat as the previous one, may be distinguished by its smaller size and smaller spores, the latter being only $7 \times 4 \mu$. It is just possible that this species is only a small, immature form of *D. bullacea*, but there is little chance of proving it. I have examined the spores of the type specimens and find them as represented.

3. ATYLOSPORA Fayod, Ann. Sci. Nat. VII. 9: 376. 1889

Psathyra Quél. Champ. Jura Vosg. 118. 1872. Not *Psathyra* Spreng. 1818. Not *Psathura* Commers. 1789.

Pluteopsis Fayod, Ann. Sci. Nat. VII. 9: 377. 1889.

This rather difficult genus, well represented both in temperate and tropical regions, is characterized by a cartilaginous stipe, a straight margin appressed when young, and the absence of a veil. It is difficult to distinguish in the herbarium from *Psilocybe* and *Drosophila*. *Psathyrella* differs in having black spores, but even here it is at times hard to draw the line.

Pileus white with blackish squamules, becoming smooth and purplish-brown with age. 1. *A. tigrina*.

Pileus not as above.

Pileus 3-10 mm. broad.

Stipe 5 mm. long; pileus avellaneous.

2. *A. diminutiva*.

Stipe 1-2 cm. long.

Pileus whitish.

3. *A. commiscibilis*.

Pileus yellow.

4. *A. epibates*.

Pileus red.

5. *A. lateritia*.

Pileus pinkish-gray.

6. *A. byssina*.

Pileus pale-umbrinous.

7. *A. euthugramma*.

Pileus 1-2 cm. broad.

Pileus white when moist, fulvous or umbrinous when dry.

Stipe about 1 cm. long.

8. *A. coprinoceps*.

Stipe reaching 4 cm. long.

9. *A. Musae*.

Pileus uniformly avellaneous-isabelline.

10. *A. mexicana*.

Pileus pale-avellaneous, isabelline on the disk.

11. *A. albipes*.

Pileus sordid-luteous.

12. *A. bulbiliosa*.

Pileus pale-fulvous with a peculiar sheen.

13. *A. pallidispora*.

Pileus bay, chestnut, or brown.

Pileus not umbonate, slightly depressed.

14. *A. cubensis*.

Pileus umbonate.

Surface decorated with white scales. 15. *A. plumigera*.

Surface glabrous.

- | | |
|--|------------------------------|
| Surface not striate; stipe 1.5 cm.
long. | 16. <i>A. mammillata</i> . |
| Surface distinctly striate; stipe
3 cm. long. | 17. <i>A. cinchonensis</i> . |
| Pileus 2-3 cm. broad. | |
| Pileus pallid with purplish tints. | 18. <i>A. Roystoniae</i> . |
| Pileus avellaneous-isabelline. | 19. <i>A. plana</i> . |
| Pileus fulvous. | 20. <i>A. pseudotenera</i> . |
| Pileus fuliginous. | 21. <i>A. fuliginosa</i> . |

1. *Atylospora tigrina* (Pat.)

Psathyra tigrina Pat. Bull. Soc. Myc. Fr. 15: 197. 1899.

Known only from specimens collected by Duss on rotten stumps at Basse-Terre, Guadeloupe. It has many characters in common with *Coprinus*, but the spores are purplish-brown.

2. *Atylospora diminutiva* sp. nov.

Pileus hemispheric to broadly convex, with a small umbo, not expanding, scattered, 6 mm. broad and 2 mm. thick; surface striate, uniformly avellaneous, glabrous; margin straight, entire, concolorous; lamellae adnate, ventricose, distant, umbrinous to fuliginous, paler and entire on the edges; spores broadly lemon-shaped, smooth, subopaque, uniguttulate, purplish-brown under the microscope, about $5 \times 4 \mu$; stipe curved, equal, slightly roughened, umbrinous, 5 mm. long, 0.5 mm. thick.

Type collected on a dead fallen stick at Cinchona, Jamaica, 1,500 m. elevation, December 25-January 8, 1908-9, W. A. & Edna L. Murrill 463 (herb. N. Y. Bot. Gard.).

3. *Atylospora commiscibilis* (Berk.)

Agaricus commiscibilis Berk. in Warming, Vidensk. Meddel. 1879-80: 33. 1879.

Psathyra commiscibilis (Berk.) Sacc. Syll. Fung. 5: 1068. 1887.

Described from specimens collected at Rio de Janeiro, Brazil, by Glaziou, and also found in St. Thomas. The species greatly resembles *Psathyrella minutula* in general appearance, but is distinguished by its spores, which are ovoid to ellipsoid, smooth, purplish-brown under the microscope, $7-8 \times 4-5 \mu$.

4. *Atylospora epibates* (Fries)

Agaricus epibates Fries, Nova Acta Soc. Sci. Upsal. III. 1: 26. 1851.

Psathyra epibates (Fries) Sacc. Syll. Fung. 5: 1070. 1887.

Known only from specimens collected by Oersted on decayed wood in Naranjo, Costa Rica. This is a minute species resembling *Prunulus*, the slender stipe being orbicular at the base and appressed to the matrix. There is a good colored figure at Copenhagen, but no specimens have been found.

5. *Atylospora lateritia* sp. nov.

Pileus hemispheric to broadly convex, not expanding, solitary, 8 mm. broad, 3 mm. thick; surface smooth, glabrous, striate, dull-lateritious, pale-testaceous on the disk; margin straight, entire, whitish; lamellae adnexed, rather broad, distant, pale-chestnut, entire and somewhat paler on the edges; spores ovoid or ellipsoid, smooth, usually 2-guttulate, purplish-brown, about $9 \times 5 \mu$; stipe equal or slightly tapering upward, concolorous below, paler above, smooth, glabrous, 2 cm. long, 1-1.5 mm. thick.

Type collected among moss on a clay bank at Cinchona, Jamaica, December 25-January 8, 1908-9, *W. A. & Edna L. Merrill* 471 (herb. N. Y. Bot. Gard.)

6. *Atylospora byssina* sp. nov.

Pileus strongly convex to plane, thin, fragile, not umbonate, gregarious, 5-10 mm. broad; surface varying from pinkish-gray to brown tinged with pink, glabrous, nearly smooth; margin entire, concolorous; lamellae adnate, crowded, rather broad, becoming dark-purplish-brown or almost black; spores ellipsoid, rounded at both ends, smooth, very pale purplish-brown under the microscope, $7-8 \times 4-5 \mu$; stipe filiform, pallid or rosy-isabelline, smooth, glabrous, about 1.5 cm. long, less than 1 mm. thick, attached to the substratum by a very conspicuous, radiating mass of tomentum, which is evidently white when fresh, but slightly yellowish in dried specimens.

Type collected on a dead log in open woods at Rio Piedras, Porto Rico, December 1, 1915, *Bruce Fink* 481 (herb. N. Y. Bot. Gard.). Also collected in the same locality on dead logs in

April and June, 1912, *J. R. Johnston* 330, 420. This species resembles *A. mexicana* and also species of *Coprinus*. Many of the pilei have deliquesced or otherwise disappeared, leaving only the stipes and the cottony patches of mycelium.

7. *Atylospora euthugramma* (Berk. & Curt.)

Agaricus euthugrammus Berk. & Curt. Jour. Linn. Soc. 10: 290. 1868.

Naucoria euthugramma Sacc. Syll. Fung. 5: 835. 1887.

Known only from minute specimens collected on decayed wood in Cuba by Wright. It is said by the author to have the habit of *Agaricus disseminatus* but to have spores quite different in color and size. I find them to be broadly ellipsoid, smooth, pale-purplish-brown under the microscope, $5 \times 4 \mu$.

8. *Atylospora coprinoceps* (Berk. & Curt.)

Agaricus coprinoceps Berk. & Curt. Jour. Linn. Soc. 10: 290. 1868.

Naucoria coprinoceps (Berk. & Curt.) Sacc. Syll. Fung. 5: 835. 1887.

Known only from specimens collected by Wright on logs in Cuba. The spores are too dark for *Naucoria*.

9. *Atylospora Musae* (Earle)

Gymnochilus Musae Earle, Inf. An. Estac. Centr. Agron. Cuba 1: 239. 1906.

This species occurs on fallen dead stems and leaves of banana trees in Cuba, where it was found and described by Earle. Although very near to species of *Drosophila*, it seems to me to belong rather in *Atylospora*. The stipe is very slender, only 2 mm. thick, and the spores are ellipsoid or ovoid, smooth, 2-guttulate, nearly opaque, decidedly purplish-brown under the microscope, $6-8 \times 4-5 \mu$.

10. *Atylospora mexicana* Murrill, sp. nov.

Pileus convex, not umbonate, not fully expanding, gregarious to subcespitose, 1 cm. broad; surface glabrous, smooth, some-

times pitted or reticulate-rugose in dried specimens, uniformly avellaneous-isabelline; margin paler, thin, entire, not incurved, but deflexed and appressed when young; lamellae adnate, arcuate, broad, rather crowded, white to pale-avellaneous and finally purplish-brown with white edges; spores ellipsoid, rounded at both ends, smooth, pale-purplish-brown with a yellowish tint under the microscope, $7 \times 3.5-4.5 \mu$; stipe curved, tapering upward, white, smooth and glabrous above, with abundant cottony tomentum at and near the base, 1.5 cm. long, 2 mm. thick.

Type collected on dead wood in a moist, virgin forest at Motzorongo, near Cordoba, Mexico, January 15, 1910, *W. A. & Edna L. Murrill* 1073 (herb. N. Y. Bot. Gard.).

11. *Atylospora albipes* sp. nov.

Pileus convex, not umbonate, scattered, 1 cm. broad; surface striate, finely asperulate, pale-avellaneous, isabelline on the disk; margin straight, entire, concolorous; lamellae adnate, rather broad, crowded, white to pinkish, at length discolored; spores ellipsoid, smooth, decidedly purplish-brown under the microscope, about $7-8 \times 4-5 \mu$; stipe very slender, subcartilaginous, equal, white, shining, hollow, 2-3 cm. long, 1-2 mm. thick.

Type collected on a decayed banana stalk in a ravine east of Hope Gardens, Jamaica, 240 m. elevation, December 12, 1908, *W. A. & Edna L. Murrill* 22 (herb. N. Y. Bot. Gard.).

12. *Atylospora bulbillosa* (Fries)

Agaricus bulbillosus Fries, Nova Acta Soc. Sci. Upsal. III. 1:26. 1851.

Psathyra bulbillosa (Fries) Sacc. Syll. Fung. 5:1065. 1887.

Known only from specimens collected by Oersted on the ground near Cartago, Costa Rica. The name refers to the enlarged, bulbous base of the stipe. There is a good colored figure at Copenhagen, but no specimens have been found.

13. *Atylospora pallidispora* sp. nov.

Pileus convex to subexpanded, with a short, cuspidate umbo, scattered, 1 cm. broad; surface finely tomentose, not striate, pale-fulvous with a peculiar sheen; lamellae adnate, rather crowded, broad behind, latericeous-fulvous, entire and pallid on the edges;

spores broadly ellipsoid or ovoid, smooth, very pale-purplish-brown with a yellowish tint under the microscope, $5-6 \times 3.5-4 \mu$; stipe cylindric, equal, cartilaginous, concolorous above, darker below, finely fibrillose-lacerate, 1.3 cm. long, 1 mm. thick.

Type collected on a dead fallen stick at Cinchona, Jamaica, 1,500 m. elevation, December 25-January 8, 1908-9, *W. A. & Edna L. Murrill* 666 (herb. N. Y. Bot. Gard.).

14. *Atylospora cubensis* sp. nov.

Pileus thin, delicate, convex to expanded and slightly depressed, 1-1.5 cm. broad; surface glabrous, hygrophanous, pale-chestnut, paler when dry; margin faintly striate, concolorous; lamellae adnexed, crowded, subventricose, pallid to purplish-brown, entire and concolorous on the edges; spores ellipsoid, smooth, pale-purplish-brown under the microscope, $7 \times 4-5 \mu$; stipe cylindric, white, shining, glabrous, hollow, 3 cm. long, 1-2 mm. thick.

Type collected by Mrs. C. F. Baker along paths at Santiago de las Vegas, Cuba, July 31, 1904, *F. S. Earle* 138 (herb. N. Y. Bot. Gard.).

15. *Atylospora plumigera* (Berk. & Curt.)

Agaricus plumiger Berk. & Curt. Jour. Linn. Soc. **10**: 292. 1868.
Psathyra plumigera (Berk. & Curt.) Sacc. Syll. Fung. **5**: 1069. 1887.

Known only from Wright's collections on dead sticks in woods in Cuba. The spores are distinctly ovoid, smooth, pale-purplish-brown, about $8 \times 5 \mu$.

16. *Atylospora mammillata* sp. nov.

Pileus conic to campanulate with a very prominent, conic umbo, not expanding, solitary, 1 cm. broad and 5 mm. high; surface glabrous, hygrophanous, not striate, fulvous-badious, fulvous on the umbo; margin dentate, spreading, paler; lamellae adnexed, ascending, narrow behind and very broad and ventricose in front, subcrowded, umbrinous, concolorous and entire on the edges; spores pyriform or strongly ovoid, tapering at one end, sometimes almost turbinate, smooth, clear-purplish-melleous under the microscope, $5-7 \times 4-5 \mu$; stipe cylindric, equal, short, concolorous, whitish-pulverulent at the apex, 1.5 cm. long, 2 mm. thick.

Type collected in soil on a dry bank at Cinchona, Jamaica, 1,500 m. elevation, December 25-January 8, 1908-9, *W. A. & Edna L. Murrill 608* (herb. N. Y. Bot. Gard.).

17. *Atylospora cinchonensis* sp. nov.

Pileus conic to campanulate, not expanding, rather thin, fleshy, with a prominent, conic umbo, 1.5 cm. broad and high; surface distinctly striate to the umbo, subglabrous, hygrophalous, umbrinous to fuliginous, fulvous on the umbo; margin straight, entire, concolorous; lamellae broad, ventricose, distant, fuliginous, concolorous and entire on the edges; spores broadly and distinctly ovoid, smooth, pale-purplish-brown under the microscope, about $5 \times 3.5-4 \mu$; stipe curved, equal, smooth, glabrous, fulvous, pallid near the base, 3 cm. long, 1-2 mm. thick.

Type collected among moss in clay soil on a shaded bank at Cinchona, Jamaica, 1,500 m. elevation, December 25-January 8, 1908-9, *W. A. & Edna L. Murrill 575* (herb. N. Y. Bot. Gard.).

18. *Atylospora Roystoniae* (Earle)

Gymnochilus Roystoniae Earle, Inf. An. Estac. Centr. Agron. Cuba 1:239. 1906.

Described from specimens collected by Earle on decaying logs of the royal palm near Managua, Cuba. Specimens collected by the writer in southern Mexico greatly resemble the types of this species and may not be distinct.

19. *Atylospora plana* sp. nov.

Pileus thin, delicate, expanded, almost perfectly plane, solitary, 2 cm. broad; surface striate, glabrous, avellaneous-isabelline, becoming isabelline when dry; margin concolorous, subentire, upturned on drying; lamellae adnate, narrow, crowded, becoming purplish-brown, whitish on the edges; spores ellipsoid, rounded at both ends, smooth, pale-purplish-brown with a yellowish tint under the microscope, indistinctly 2-guttulate, $7 \times 3.5 \mu$; stipe slender, equal, smooth, glabrous, snow-white, yellowish in dried specimens, 3 cm. long, 2 mm. thick.

Type collected on dead wood at Cinchona, Jamaica, 1,500 m. elevation, December 25-January 8, 1908-9, *W. A. & Edna L. Murrill 624* (herb. N. Y. Bot. Gard.). This species is near the boundary line between *Atylospora* and *Drosophila*.

20. *Atylospora pseudotenera* (Fries)

Agaricus pseudotener Fries, Nova Acta Soc. Sci. Upsal. III. 1: 26, 1851.

Psathyra pseudotenera (Fries) Sacc. Syll. Fung. 5: 1065. 1887.

Known only from specimens collected by Oersted at Naranjo, Costa Rica. The species resembles *Galerula tenera*. There is a good colored figure at Copenhagen, but no specimens have been found.

21. *Atylospora fuliginosa* sp. nov.

Pileus hemispheric, not expanding, not umbonate, gregarious, 2 cm. broad and 1 cm. high; surface smooth, glabrous, hygrophanous, slightly striate, uniformly fuliginous, becoming somewhat paler on the disk; margin straight, eroded, concolorous; lamellae adnate, broad, ventricose, subcrowded, fuliginous, entire on the edges; spores usually ovoid, tapering at one end, smooth, purplish-brown, $7 \times 4-5 \mu$; stipe equal or somewhat larger below, slender, smooth, glabrous, concolorous, whitish toward the base, 4-5 cm. long, 1.5-2 mm. thick.

Type collected in damp soil at Morce's Gap, near Cinchona, Jamaica, 1,500 m. elevation, December 29, 30, January 2, 1908-9. *W. A. & Edna L. Murrill* 748 (herb. N. Y. Bot. Gard.). Also collected at the same time and place, *W. A. & Edna L. Murrill* 680.

4. *PSATHYRELLA* (Fries) Quél. Champ. Jura Vosg. 122. 1872

Agaricus § *Psathyrella* Fries, Epicr. Myc. 237. 1838.

Characterized by black spores and a straight, appressed margin when young. It is best known, perhaps, through its interesting little representative, *Psathyrella minutula*, which is widely distributed. A number of temperate species belong to this genus.

Pileus small, 2 cm. or less broad.

Pileus white or gray.

Spores tapering at the ends.

Spores rounded at the ends.

Pileus avellaneous.

Pileus conic; solitary.

Pileus convex; caespitose.

Pileus reddish-brown to pale-rosy-isabelline.

Pileus large, 4-7 cm. broad.

1. *P. minutula*.

2. *P. grisea*.

3. *P. mexicana*.

4. *P. Earlei*.

5. *P. cubensis*.

6. *P. Stevensonii*.

1. *Psathyrella minutula* (Schaeff.)

Agaricus minutulus Schaeff. Fung. Bavar. 4: Ind. 72. 1774.

Agaricus disseminatus Pers. Syn. Fung. 403. 1801.

Psathyrella disseminata Quél. Champ. Jura Vosg. 123. 1872.

This very attractive little species was first described from Bavaria and accurately figured in color by Schaeffer. The synonymy is considerably complicated but it seems quite certain that the specific name under which the plant is best known has been in use since 1801, when Persoon extended his former use of this name to include the juvenile form as figured by Schaeffer in his plate 308.

The species appears to be cosmopolitan, or at least very widely distributed on decayed wood and moist earth containing organic matter, the caps often occurring in such large numbers in one spot that it would seem impossible to count them. *Psathyrella prona* is a European species somewhat similar in appearance but with much larger spores.

Xuchiles, near Cordoba, Mexico, *W. A. & Edna L. Murrill* 1159; Sumidero, Cuba, *Shafer* 13913.

2. *Psathyrella grisea* sp. nov.

Pileus very thin, small, conic to campanulate, not expanding, gregarious to subcespitose, 5-10 mm. broad and high; surface griseous, minutely whitish-floccose to subglabrous, distinctly striate to the disk; margin thin, concolorous, becoming irregular or splitting with age, incurved on drying; lamellae adnate, rather distant, very thin and fragile, becoming blackish with age; spores ellipsoid, rounded at both ends, smooth, dark-purplish-brown under the microscope, $7-8.5 \times 3.5-4.5 \mu$; stipe filiform, slightly increasing toward the base, smooth, white, glabrous, 2-3 cm. long, 1 mm. or less thick.

Type collected on fallen dead sticks at Motzorongo, near Cordoba, Mexico, January 15, 1910, *W. A. & Edna L. Murrill* 1077 (herb. N. Y. Bot. Gard.). A dainty little plant, reminding one of *Psathyrella minutula* and certain species of *Coprinus*. My field notes state that the pileus soon deliquesces.

3. *Psathyrella mexicana* sp. nov.

Pileus conic, not expanding, solitary, 1 cm. broad and high; surface hygrophanous, glabrous, rugose-striate, avellaneous, pale-

isabelline on the disk; margin straight, entire, concolorous; lamellae adnate, crowded, rather broad, grayish-white at first, becoming black with age; spores ellipsoid, smooth, opaque, dark-purplish-brown under the microscope, black in mass, $12 \times 7 \mu$; stipe rather fragile, filiform, smooth, snow-white, mycelioid at the base, 4 cm. long, 1 mm. thick.

Type collected in humus in a moist, virgin forest at Motzorongo, near Cordoba, Mexico, January 15, 1910, *W. A. & Edna L. Murrill 1066* (herb. N. Y. Bot. Gard.).

4. *Psathyrella Earlei* sp. nov.

Pileus membraneous, not deliquescent, convex, obtuse, caespitose, 1-2 cm. broad; surface hygrophanous, glabrous, crustose-rugose, grayish-brown, somewhat darker on the disk, paler when dry; margin concolorous, striate, not splitting on the backs of the lamellae, which are adnate, crowded, rather broad, avellaneous to blackish; spores broadly ellipsoid, smooth, opaque, dark-brown under the microscope, black in mass, $10-12 \times 8-9 \mu$; stipe slender, equal, tubular, glabrous, minutely pubescent at the apex, white with a brownish tint, cartilaginous, 5-7 cm. long, 1-1.5 mm. thick.

Type collected on buried wood in a banana field at Santiago de las Vegas, Cuba, June 18, 1904, *F. S. Earle 96* (herb. N. Y. Bot. Gard.).

5. *Psathyrella cubensis* sp. nov.

Pileus thin, campanulate to expanded, sometimes upturned at the margin with age, gregarious, 1-1.5 cm. broad; surface glabrous, hygrophanous, sometimes rugose, reddish-brown to pale-rosy-isabelline; margin concolorous, striate, becoming irregular or fluted; lamellae adnate or adnexed, broad, ventricose, rather crowded, at first pallid, becoming dark-purplish-brown or almost black; spores very broadly ellipsoid, opaque, uniguttulate, chestnut-colored under the microscope, black in mass, $9-12 \times 7-8 \mu$; stipe filiform, glabrous, smooth, white and farinaceous at the apex, reddish below, 3-5 cm. long, 1 mm. thick.

Type collected in clay soil in a banana field at Santiago de las Vegas, Cuba, June 18, 1904, *F. S. Earle 98* (herb. N. Y. Bot. Gard.). Also collected by Van Herman in the same locality, September 8, 1904, *F. S. Earle 172*.

6. *Psathyrella Stevensonii* sp. nov.

Pileus conic or campanulate to convex and finally expanding, more or less umbonate, gregarious to subcespitose, 4-7 cm. broad; surface hygrophanous, distinctly sulcate-striate to the disk, brown or chestnut at first, fading to cinereous or isabelline, covered with prominent, white, floccose scales when young, at length glabrous; margin appressed when young, splitting with age; context with mild flavor and pungent, rather pleasant odor; lamellae adnexed, crowded, rather narrow, pallid to almost black, not deliquescing; spores ellipsoid, smooth, opaque, dark-chestnut under the microscope, black in mass, about $11 \times 6 \mu$; stipe tapering upward, white, shining, hollow, glabrous or whitish-floccose, 7-10 cm. long, 3-8 mm. thick; veil white, scanty, soon evanescent.

Type collected in garden soil at Rio Piedras, Porto Rico, June, 1915, *J. A. Stevenson 2785* (herb. N. Y. Bot. Gard.). Also collected in chip dirt in a yard at Herradura, Cuba, October 10, 1906, *F. S. Earle 546*, and in a door-yard at the same place, November 3, 1906, *F. S. Earle 558*. This plant is rather large and the stipe rather thick for *Psathyrella*, but it cannot go into *Coprinus* because the lamellae do not deliquesce. This character was carefully noted by Stevenson. At first sight, one is reminded of *Coprinus micaceus*, which is smaller, more clustered, and has much smaller spores. Cooke's figure of *Psathyrella arata* represents the form of the plant fairly well.

DOUBTFUL SPECIES

Psathyrella hiascens (Fries) Quél. Champ. Jura Vosg. 123. 1872. (*Agaricus hiascens* Fries, Syst. Myc. 1: 303. 1821.) Described from specimens collected on the ground in humid woods in Europe and reported by Peck from New York. Specimens collected in Costa Rica by Oersted were referred to this species by Fries, but it is very probable that they are distinct. Oersted's figures represent a densely cespitose plant with hemispheric pileus, totally different from the campanulate, umbonate pileus shown in Bulliard's and Cooke's figures. Unfortunately, there are no specimens extant from which spores might be obtained. This species was also reported from Dominica by Miss A. L. Smith, but I have not seen the specimens.

Psathyrella modesta (Berk.) Sacc. Syll. Fung. 5: 1133. 1887. (*Agaricus modestus* Berk. Lond. Jour. Bot. 1: 453. 1842.) Described from specimens collected by Hinds on stumps in New Guinea. Reported from St. Vincent by Massee in 1892. I have not examined Massee's specimens.

5. *PSILOCYBE* (Fries) Quél. Champ. Jura Vosg. 116. 1872
Agaricus § *Psilocybe* Fries, Syst. Myc. 1: 289. 1821.

This difficult genus differs from *Athylospora* in having the margin of the pileus incurved when young, and from *Campanularius* in having purplish-brown instead of black spores. It is well represented in temperate regions.

Pileus white, becoming brown; stipe white to fulvous.	1. <i>P. palmigena</i> .
Pileus rosy-isabelline; stipe subconcolorous.	2. <i>P. orizabensis</i> .
Pileus fulvous; stipe white.	3. <i>P. dichroma</i> .
Pileus brown; stipe concolorous.	4. <i>P. plutonia</i> .

1. *PSILOCYBE PALMIGENA* (Berk. & Curt.) Sacc. Syll. Fung. 5: 1049. 1887

Agaricus palmigena Berk. & Curt. Jour. Linn. Soc. 10: 292. 1868.

Collected only once by Wright on palm stumps in woods in Cuba. The spores are ellipsoid or ovoid, smooth, distinctly purplish-brown under the microscope, $7 \times 4-5 \mu$. The lamellae are described as free, while the type specimens are too poorly preserved to show their attachment.

2. *Psilocybe orizabensis* sp. nov.

Pileus conic, not expanding, not umbonate, solitary, 1.5 cm. broad and high; surface smooth, glabrous, not striate, uniformly rosy-isabelline; margin entire, concolorous; lamellae adnate, crowded, broad, whitish at first, becoming dark-isabelline with a rosy tint; spores oblong-ellipsoid, smooth, opaque, dark-chestnut under the microscope, about $12 \times 6 \mu$; stipe slightly larger below, smooth, glabrous, paler than the pileus, rather brittle, 5 cm. long, 1.5-2 mm. thick.

Type collected in soil at Orizaba, Mexico, 1,200 m. elevation, January 10-14, 1910, *W. A. & Edna L. Murrill* 771 (herb. N. Y. Bot. Gard.).

3. *PSILOCYBE DICHROMA* (Berk. & Curt.) Sacc. Syll. Fung. 5: 1057. 1887

Agaricus dichromus Berk. & Curt. Jour. Linn. Soc. 10: 292. 1868.

Known only from specimens collected by Wright on dead wood in Cuba. The spores are broadly ovoid, smooth, opaque, distinctly purplish-brown under the microscope, $7 \times 4-5 \mu$.

4. *PSILOCYBE PLUTONIA* (Berk. & Curt.) Sacc. Syll. Fung. 5: 1056. 1887

Agaricus plutonius Berk. & Curt. Jour. Linn. Soc. 10: 292. 1868.

Known only from Wright's single collection on decayed wood in Cuba. The spores were described as subglobose, but are now distinctly angular, as in *Entoloma*, decidedly purplish-brown under the microscope, uniguttulate, 4μ in diameter. If this angularity is not due to shrinkage, the species is readily distinguished by it and is quite anomalous. *Psathyra cubispora*, which occurs on moist ground in South America, may be referred to in this connection.

DOUBTFUL SPECIES

Psilocybe subviridis (Berk. & Curt.) Sacc. Syll. Fung. 5: 1051. 1887. (*Agaricus subviridis* Berk. & Curt. Jour. Linn. Soc. 10: 292. 1868.) Described from specimens collected by Wright on decayed wood in Cuba. The types at Kew are rather poor and the description omits many important characters, such as taste, and the color of the context and lamellae; but the spores are ellipsoid or ovoid, smooth, very pale purplish-brown with a yellowish tint under the microscope, $7 \times 4 \mu$.

6. *CAMPANULARIUS* Roussel, Fl. Calvados ed. 2. 64. 1806

Agaricus § *Panaeolus* Fries, Epicr. Myc. 234. 1838.

Panaeolus Quél. Champ. Jura Vosg. 121. 1872.

Anellaria P. Karst. Bidr. Finl. Nat. Folk 32: 517. 1879.

Chalymota P. Karst. Bidr. Finl. Nat. Folk 32: 518. 1879.

This genus, which is better known as *Panaeolus*, is characterized by its black, usually lemon-shaped, spores, cartilaginous stipe,

incurved margin, and non-deliquestent lamellae. The species generally occur on manure and are therefore very widely distributed, both in temperate and tropical regions, although the genus is not a large one.

Stipe reddish-brown, hollow, 2-4 mm. thick.

Stipe white, solid, 4-8 mm. thick.

Stipe stramineous, only 4 cm. long.

1. *C. campanulatus*.

2. *C. solidipes*.

3. *C. anomalus*.

I. *CAMPANULARIUS CAMPANULATUS* (L.) Earle, Bull. N. Y. Bot. Gard. 5: 434. 1909

Agaricus campanulatus L. Sp. Pl. 1175. 1753.

Agaricus papilionaceus Bull. Herb. Fr. pl. 561, f. 2; hyponym. 1791; Pers. Syn. Fung. 410. 1801.

Panaeolus campanulatus Quél. Champ. Jura Vosg. 1: 122. 1872.

This species is common and widely distributed on manure or manured ground throughout temperate and tropical America, as well as Europe. The spores are like those of *C. solidipes*, but smaller.

Bermuda, Brown, Britton, & Seaver 1307, 1316, 1458, 1477, 1517; Bahamas, Britton & Millspaugh 2503; Cuba, Wright; Santiago de las Vegas, Cuba, Earle 34; Rio Piedras, Porto Rico, Fink 550; Cockpit Country, Jamaica, Murrill & Harris 1072; Guadeloupe, Duss; Grenada, Broadway; British Honduras, Peck; Jalapa, Mexico, Murrill 108, 151, 177.

2. *Campanularius solidipes* (Peck)

Agaricus solidipes Peck, Ann. Rep. N. Y. State Cab. 23: 101. 1872.

Panaeolus solidipes Sacc. Syll. Fung. 5: 1123. 1887.

This species was described from specimens collected at West Albany, New York. It is the largest and commonest species of this genus in tropical America, occurring on horse manure in pastures or along roadways. The spores are lemon-shaped, smooth, black, opaque, about $17 \times 12 \mu$. Several species seem to have been confused with this by the older mycologists.

Santiago de las Vegas, Cuba, Earle 22, 158; Hope Gardens, Jamaica, Earle 199, 326; Cinchona, Jamaica, Underwood 3173;

Stanmore Hill, Jamaica, *Mrs. Britton*, 468; Halls Delight, Jamaica, *Earle* 113; Utuado, Porto Rico, *Britton & Cowell* 1239; Mayagüez, Porto Rico, *Fink* 919; Aibonito, Porto Rico, *Fink* 1979; Grenada, *Broadway*.

3. *Campanularius anomalus* sp. nov.

Pileus convex, not fully expanding, the entire hymenophore becoming caesious to ardesiacous when bruised, gregarious, 2 cm. broad; surface smooth, uniformly stramineous, the cuticle cracking with age; margin entire, concolorous, inflexed when young; context white, rather thick; lamellae adnate or adnexed, broad, subcrowded, soon becoming black; spores lemon-shaped, smooth, opaque, perfectly black under the microscope, $10-12 \times 9 \mu$; stipe cylindric, equal, rather short, smooth, concolorous, hollow, 4 cm. long, 2.5 mm. thick; veil wanting.

Type collected among grass in a rich pasture in Troy, Cockpit Country, Jamaica, 800 m. elevation, January 12-14, 1909, *W. A. Murrill & W. Harris* 1082. This species differs decidedly from other members of the genus, but there seems to be no other place for it.

DOUBTFUL SPECIES

Panacolus fimicola (Fries) Quél. Champ. Jura Vosg. 1: 239. 1872. (*Agaricus fimicola* Fries, Syst. Myc. 1: 301. 1821.) Reported from Guadeloupe and Martinique by Duss, but possibly confused with *C. solidipes*.

Panacolus papilionaceus (Fries) Quél. Champ. Jura Vosg. 1: 122. 1872. (*Agaricus papilionaceus* Fries, Epicr. Myc. 236. 1838. Not *A. papilionaceus* Pers. Syn. Fung. 410. 1801.) Described from specimens collected in Europe. Reported from Bermuda and St. Vincent, but possibly confused with *C. campanulatus* or *C. solidipes*.

Panacolus phalenarum (Fries) Quél. Champ. Jura Vosg. 1: 121. 1872. (*Agaricus phalenarum* Fries, Epicr. Myc. 235. 1838.) Reported from Cuba and St. Thomas, but possibly confused with *C. solidipes*.

Psilocybe antillarum (Fries) Sacc. Syll. Fung. 5: 1052. 1887. (*Agaricus antillarum* Fries, Elench. Fung. 1: 42. 1828.) De-

scribed from specimens collected among straw on the island of St. Croix, Danish West Indies. Specimens collected later on the same island by Oersted were referred to this species by Fries as variety *praelonga*; and the figure of this variety at Copenhagen, drawn by Oersted, is the only thing I have found outside of the description to throw light upon the species.

The figure reminds me very forcibly of *Panecolus solidipes* Peck. The description of the species refers to the solid stipe and to the fact that the pileus sometimes becomes areolate-corrugate, but the surface is said to be yellow or white in alcohol, while the drawing of the variety shows it to be avellaneous, and in *P. solidipes* it is white. Fries evidently put his species in the genus *Psilocybe* because of the "livid-black" lamellae, although he described the spores as black. If type specimens were available, the spores could be examined and the whole question settled.

Psilocybe fortunata (Cooke) Sacc. Syll. Fung. 5: 1056. 1887. (*Agaricus fortunatus* Cooke, *Grevillea* 9: 100. 1881.) Described from specimens collected on the ground at Rio de Janeiro, Brazil, by Glaziou, and reported from St. Vincent by Massee, who may have confused it with *C. solidipes*, the spores of the two being the same. Unfortunately, the color of *P. fortunata* is not given.

NEW COMBINATIONS

For the convenience of those who prefer the older nomenclature, the following species described as new in *Atylospora* are transferred to *Psathyra*:

ATYLOSPORA ALBIPES	= <i>Psathyra albipes</i>
ATYLOSPORA BYSSINA	= <i>Psathyra byssina</i>
ATYLOSPORA CINCHONENSIS	= <i>Psathyra cinchonensis</i>
ATYLOSPORA CUBENSIS	= <i>Psathyra cubensis</i>
ATYLOSPORA DIMINUTIVA	= <i>Psathyra diminutiva</i>
ATYLOSPORA FULIGINOSA	= <i>Psathyra fuliginosa</i>
ATYLOSPORA LATERITIA	= <i>Psathyra lateritia</i>
ATYLOSPORA MAMMILLATA	= <i>Psathyra mammillata</i>
ATYLOSPORA MEXICANA	= <i>Psathyra mexicana</i>
ATYLOSPORA PALLIDISPORIA	= <i>Psathyra pallidispora</i>
ATYLOSPORA PLANA	= <i>Psathyra plana</i>

NEW YORK BOTANICAL GARDEN.

RUSTS AND SMUTS COLLECTED IN NEW MEXICO IN 1916¹

PAUL C. STANDLEY

During August and September, 1916, the writer spent four weeks at Ute Park, Colfax County, New Mexico. This locality is in the extreme northern part of the State, 60 miles southwest of Raton, and not far from the Colorado boundary. The altitude of the station is approximately 2350 meters, and the mountains in the vicinity reach an elevation of 3650 meters. The region is typical of many others in the southern Rockies. Ute Park lies about on the border between the Upper Sonoran and Transition zones. The Upper Sonoran vegetation, confined to the lower levels and drier hillsides, is characterized by pinyon and cedar, while the Transition vegetation, of the more elevated mountain sides, is dominated by the Rocky Mountain yellow pine. At higher levels the Canadian Zone, with its heavy forests of fir and Douglas and other spruces, is extensively represented, and on the highest peaks there is a well developed Arctic-Alpine Zone.

While the writer was interested primarily in the flowering plants, he devoted a large part of his time to the systematic collection of cryptogams, especially rusts. Of the latter nearly a hundred numbers were collected, 17 of which represent species new to the State,² while many others are the basis of new host records for New Mexico. In all 55 species of Uredinales were collected. The writer is inclined to believe that this number includes most of the representatives of the rust flora of the locality at this particular season.

In the following list the species formally listed are either new to the State (indicated by an asterisk) or are reported here upon hosts hitherto unrecorded for New Mexico. A few new

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² See Paul C. Standley, *Fungi of New Mexico*, *Mycologia* 8: 142-177. 1916.

records are included from sources other than the writer's collections, but unless otherwise noted all the material was obtained at Ute Park. The numbers in parenthesis are the writer's collection numbers, specimens of which are deposited in the U. S. National Herbarium.

For the identifications of the rusts as well as for other assistance in the preparation of the present paper, the writer is deeply indebted to Dr. J. C. Arthur. The Ustilaginales have been determined by Mr. H. R. Rosen, formerly of the U. S. National Herbarium.

UREDINALES

*ALLODUS COMMUTATA (Syd.) Arthur

Reported from New Mexico, upon *Valeriana* sp. by Orton.³

*ALLODUS DOUGLASII (Ellis & Ev.) Orton

Reported from New Mexico, upon *Phlox* sp., by Orton.⁴

*ALLODUS VERTISEPTA (Tracy & Gall.) Arthur

[*Puccinia vertisepta* Tracy & Gall. Jour. Myc. 4: 21. 1888].

The type was collected in New Mexico, on "*Salvia ballotae-flora*."

COLEOSPORIUM RIBICOLA (Cooke & Ellis) Arthur

[*Peridermium ribicola* Long]

On *Ribes aureum* Pursh (13309), *R. inebrians* Lindl. (13669), and *Grossularia inermis* (Rydb.) Cov. & Britt. (13728). These are all new hosts for the State. Also found at Ute Park on *Ribes Wolfii* Rothr. (14165). In the North American Flora this rust is not reported on either *Grossularia inermis* or *Ribes Wolfii*. In the case of the latter host the writer was able to find only a single rusted leaf, but on the other hosts the rust was extremely abundant.

Long⁵ reports the aecial stage of this rust from the Sandia Mountains on *Pinus edulis* Engelm. He also reports the coleo-

³ Mem. N. Y. Bot. Gard. 6: 204. 1916.

⁴ Mem. N. Y. Bot. Gard. 6: 199. 1916.

⁵ Mycologia 8: 309-311. 1916.

sporial stage from the Santa Fe National Forest, on *Ribes mescalegium* Coville. The host is probably rather *R. inebrians* Lindl., for *R. mescalegium*, so far as known to the writer from collections, is confined to the southern part of the State. In addition, Mr. Long reports the coleosporial stage from Albuquerque, on *Ribes "longifolium"* [*longiflorum*?], a name doubtless to be corrected to *R. aureum*. *R. longiflorum* is not known to occur in New Mexico.

CRONARTIUM COLEOSPORIOIDES (Diet. & Holw.) Arthur

On *Pedicularis Grayi* A. Nels., a new host record for the State (14270). Also on *Castilleja sulphurea* Rydb. (with *Puccinia Andropogonis* Schw.) (14075), *C. linariaefolia* Benth. (14275), and *C. integra* Gray (14712).

*GYMNOSPORANGIUM BETHELI Kern

I. On *Crataegus erythropoda* Ashe (13384). II. On *Juniperus scopulorum* Sarg. (14619). Prolonged search failed to reveal more than a single "cedar apple."

MELAMPSORA BIGELOVII Thüm.

New host records for the State are *Salix cordata Watsoni* Bebb (13564) and *S. subcaerulea* Piper (13758). The latter appears to be a new host for the species.

Dr. Arthur writes that the hosts of two collections reported by the writer⁶ as on *Salix* sp. have now been determined as follows: Standley 7713, from the Tunitcha Mts., is on *S. Scouleriana* Barratt; and Standley 7161, from Farmington, is on *S. Wrightii* Anderss.

MELAMPSORA LINI (Schum.) Desmaz.

II, III. On *Cathartolinum australe* (Heller) Small, a new host for the species (14091, 14543). Also on *Linum Lewisii* Pursh (13864).

*PHRAGMIDIUM ANDERSONI Shear

On *Dasiphora fruticosa* (L.) Rydb. (13321).

⁶ Mycologia 8: 153. 1916.

PHRAGMIDIUM MONTIVAGUM Arthur

A new host for the State is *Rosa Maximiliani* Nees (13308, 14587); also on *R. Fendleri* Crép. (14649).

PHRAGMIDIUM PECKIANUM Arthur

Heretofore this rust and its host, *Oreobatus deliciosus* (James) Rydb., have been known in New Mexico only from Sierra Grande. Both were abundant on the dry hills about Ute Park (13697).

PUCCINIA ABSINTHII DC.

III. On *Artemisia dracunculoides* Pursh (13666), a new host for the State. Also on *A. redolens* Gray (13894).

In the writer's previous list of New Mexican rusts⁷ a species "*Puccinia Artemisiae* DC." was cited. There is no such species, the name having been a slip of the pen for *P. Absinthii* DC., and the collections enumerated should be referred to the latter species.

*PUCCINIA AEMULANS Sydow

II, III. On *Gymnolomia multiflora* (Nutt.) Benth. & Hook. (13651).

*PUCCINIA ANDROPOGONIS Schw.

[*Aecidium micropunctum* Ellis & Ev.]

On *Castilleja sulphurea* Rydb. (with *Cronartium coleosporioides*) (14075a), *Andropogon scoparius* Michx. (with *Puccinia Ellisiana*), II (13575), and *Pentstemon Torreyi* Benth., I (14182).

*PUCCINIA ASTERIS Duby

On *Aster Wootonii* Greene (14063).

PUCCINIA CIRSII Lasch.

On *Cirsium ochrocentrum* Gray⁷ (13304, 13570) and *C. coloradense* (Rydb.) Cockerell (13561), both new hosts for the State.

PUCCINIA CLEMATIDIS (DC.) Lagerh.

New hosts for the State are *Bromus ciliatus* L., III (13652), *Agropyron tenerum* Vasey, II, III (13682), and *Bromus Porteri*

⁷ Mycologia 8: 156. 1916.

(Coul.) Nash (14524). Also found on *Elymus canadensis* L., II, III (13798), and *Clematis ligusticifolia* Nutt., I (13885).

*PUCCINIA CLINTONII Peck

On *Pedicularis fluviatilis* Heller (14485).

*PUCCINIA CONFERTA Diet. & Holw.

On *Artemisia albula* Wooton: Organ Mts., Aug. 16, 1895. Wooton.

PUCCINIA ELLISIANA Thüm.

II, III. On *Andropogon scoparius* Michx. (with *Puccinia Andropogonis*) (13575). Reported from New Mexico previously (I) on *Viola pedatifida* Don.

*PUCCINIA EPIPHYLLA (L.) Wettst.

II. On *Poa Bigelovii* Vasey & Scribn. (13673, 13890) and *P. pratensis* L. (13892).

*PUCCINIA GENTIANAE (Str.) Link

On *Dasystephana Bigelovii* (Gray) Rydb. (13865).

PUCCINIA GROSSULARIAE (Schum.) Lagerh.

II. On *Carex nebraskensis* Dewey (13905). Only the aecial stage reported from the State previously.

*PUCCINIA HIERACII (Schum.) Mart.

On *Hieracium Fendleri* Gray (13361).

*PUCCINIA KUHNIAE Schw.

On *Kuhnia rosmarinifolia* Vent. (14116).

PUCCINIA MENTHAE Pers.

A new host for the State is *Monarda comata* Rydb. (13312, 14632). Also on *Monarda stricta* Wooton, II, III (14074, 14741).

*PUCCINIA MILLEFOLII Fekl.

On *Achillea lanulosa* Nutt. (14077).

PUCCINIA MUHLENBERGIAE Arth. & Holw.

II, III. On *Muhlenbergia trifida* Hack. (13663, 14525), a new host for the State.

PUCCINIA POCULIFORMIS (Jacq.) Wettst.

II, III. On *Agropyron tenerum* Vasey (13959) and *Triticum aestivum* L. (14590), both new host records for New Mexico.

PUCCINIA PSEUDOCYOPTERI Holway

II, III. On *Pseudocymopterus multifidus* Rydb. (13655). Reported from the State previously on *P. montanus*.

*PUCCINIA SAXIFRAEAE Schlecht.

On *Micranthes arguta* (Don) Small (13642) and *Heuchera parvifolia* Nutt., III (13804).

PUCCINIA SHERARDIANA Körn.

On *Malvastrum coccineum* (Pursh) Gray (14566), a new host for the State.

*PUCCINIA SUBDECORA (Syd.) Holway

I. On *Coleosanthus grandiflorus* (Hook.) Kuntze (13383).

*PUCCINIA SUBSTERILIS Ellis & Ev.

On *Stipa Vaseyi* Scribn. (13574) and *S. Scribneri* Vasey, II, X (14594).

*PUCCINIA TARDISSIMA Garrett

On *Arenaria Fendleri* Gray (13580).

PUCCINIA TUBERCULANS Ellis & Ev.

A new host for the State is *Sideranthus spinulosus* (Pursh) Sweet (14445).

PUCCINIA UNIVERSALIS Arthur

I. On *Artemisia gnaphalodes* Nutt. (13352). II, III. On *Carex Douglasii* Boott (13578, 14442). Both are new hosts for the State, the only previous record being the aecial stage on *Artemisia franserioides*.

PUCCINIA VIOLAE (Schum.) DC.

Dr. Arthur writes that a specimen in the herbarium of the New York Botanical Garden, probably on *Viola pedatifida* Don, was collected at the mouth of Sapello Canyon, September, 1901, by Prof. T. D. A. Cockerell.

UROMYCES FABAE (Pers.) De Bary

On *Lathyrus decaphyllus* Pursh (13741) and *L. arizonicus* Britton (13774), new hosts for the State. Also on *Lathyrus leucanthus* Rydb., II, III (13645) and *Vicia americana* Muhl. (14424).

UROMYCES GENTIANAE Arthur

II. On *Amarella strictiflora* (Rydb.) Greene (13778). Reported from the State previously on *A. heterosepala*.

*UROMYCES GRAMINICOLA Burrill

II, III. On *Panicum virgatum* L. (13685). In the North American Flora this rust is not reported from west of Kansas and Oklahoma.

*UROMYCES HEDYSARI-OBSCURI (DC.) Wint.

II, III. On *Hedysarum pabulare* A. Nels. (13394).

UROMYCES INTRICATUS Cooke

[*U. Eriogoni* Ellis & Hark.]

A new host for the State is *Eriogonum Jamesii* Benth. (13800). Also on *E. racemosum* Nutt. (14711), only a single rusted leaf found after much search; usually the rust is very abundant on this species in New Mexico.

UROMYCES PROEMINENS (DC.) Pass.

II. On *Poinsettia dentata* (Michx.) Klotzsch & Garcke, at Raton (13261), a new host for the State. Also on *Chamaesyce serpyllifolia* (Pers.) Small, II, III (14233).

UROMYCES PUNCTATUS Schroet.

[*U. Astragali* Sacc.]

A new host for New Mexico is *Oxytropis deflexa* (Pall.) DC. (13860).

The following additional rusts were collected at Ute Park, all on hosts upon which they have been found in the State previously: *Aecidium Compositarum* Auct., on *Dugaldea Hoopesii* (Gray) Rydb. (13756); *Melampsora albertensis* Arthur, on *Populus aurea* Tidestrom, apparently scarce (14550); *Phragmidium imitans* Arthur, on *Rubus arizonicus* (Greene) Rydb. (14650); *Phragmidium Potentillae* (Pers.) P. Karst., II, III, on *Potentilla strigosa* Pall. (13916); *Puccinia Grindeliae* Peck, on *Grindelia aphanactis* Rydb. (13639, 14589); *Puccinia Helianthi* Schw., on *Helianthus annuus* L., very scarce, although sunflowers grew everywhere (14467); *Puccinia hemispherica* Peck, III, on *Lactuca pulchella* (Pursh) DC. (13569, 14257); *Puccinia Oxalidis* (Lev.) Diet. & Ellis, on *Ionoxalis violacea* (L.) Small (14691); *Puccinia Taraxaci* Plowr., on *Taraxacum taraxacum* (L.) Karst. (14581); *Pucciniastrum Agrimoniae* (Schw.) Tranz., II, on *Agrimonia striata* Michx. (14643); *Pucciniastrum pustulatum* (Pers.) Dietel, II, on *Epilobium novomexicanum* Hausskn. (13903); *Uromyces Rudbeckiae* A. & H., on *Rudbeckia laciniata* L. (13735); *Uropyxis sanguinea* (Peck) Arthur, on *Odostemon repens* (Lindl.) Cockerell (13585).

USTILAGINALES

USTILAGO BROMIVORA (Tul.) Fisch. de Waldh.

A new host for the State is *Bromus Richardsoni* Link (14148). Also on *B. polyanthus* Shear (13797).

*USTILAGO CRUS-GALLI Tracy & Earle

On *Echinochloa zelayensis* (H.B.K.) Schult. (14784). Apparently a new host for the species.

USTILAGO HORDEI (Pers.) Kell. & Swingle

On *Hordeum trifurcatum* Jacq., cultivated (13796).

USTILAGO HYPODYTES (Schlecht.) Fr.

On *Sitanion longifolium* J. G. Smith (14114), a new host for the State. Also on *Stipa Vaseyi* Scribn. (14703).

Ustilago levis was collected also, abundant on cultivated oats (14440).

UNITED STATES NATIONAL MUSEUM,
WASHINGTON, D. C.

A PHYLLACHORA OF THE ROYAL PALM

JOHN R. JOHNSTON AND STEPHEN C. BRUNER

(WITH PLATE 2, CONTAINING 2 FIGURES)

Recently while examining some royal palms (*Roystonea regia* Cook) near Rincón, Cuba, the writers were attracted by a fungus which formed conspicuous black, carbonaceous masses several centimeters long on the midribs of the leaves. These masses were seen to be made up of more or less confluent groups of stromata developed in a closely crowded condition beneath the epidermis of the host. The fungus was also present on the leaf-segments but here the growth was more restricted and less conspicuous than on the midrib.

A study of this fungus showed it to be a *Phyllachora* and, so far as could be determined from an examination of the available literature, distinct from any previously described species. It is distinguished from the other species occurring on the Palmae chiefly by the large size of its asci.

The economic importance of the fungus appears to be slight. It has as yet been observed on only a few plants and the damage to these was not serious. A technical diagnosis is offered, as follows:

***Phyllachora Roystoneae* sp. nov.**

Stromata subcutaneous, united to parenchyma and epidermis, black, carbonaceous, gregarious, collected in elongate, subconfluent to confluent groups commonly 2-5 cm \times 1-6 mm., the separate stromata subcircular to elliptic, convex to conic-convex, commonly 0.3 to 1 mm. in diameter, phyllogenous; perithecia formed as locules in the stroma, subglobose, crowded, in one layer, 260-430 μ in diameter, the ostioles erumpent, indistinct or slightly papilliform; asci clavate, rounded or subapplanate at the apex stipitate, 116-186 \times 12-20 μ , eight-spored; paraphyses absent or soon evanescent; spores irregularly monostichous to subdistichous, fusiform, sub-acute at each end, hyaline, thin-walled, stuffed

with granular protoplasm, frequently several-guttulate, $22-28.4 \times 8-10 \mu$.

Habitat on living leaves of *Roystonea regia* Cook, Rincón, Havana, Cuba.

ESTACIÓN EXPERIMENTAL AGRONÓMICA,
SANTIAGO DE LAS VEGAS, CUBA.

EXPLANATION OF PLATE 2

Phyllachora Roystoneae Johnston & Bruner

- FIG. 1. A. Perithecia in section, much enlarged.
B. A single ascus, showing the spores in outline.
C. Ascospores in outline, also much enlarged.

FIG. 2. A, B, C. Different views of the stromata as seen on the host, natural size and somewhat enlarged.

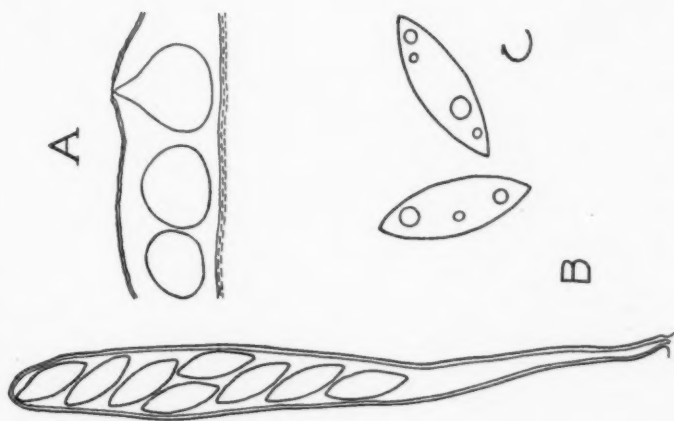


FIG. 1

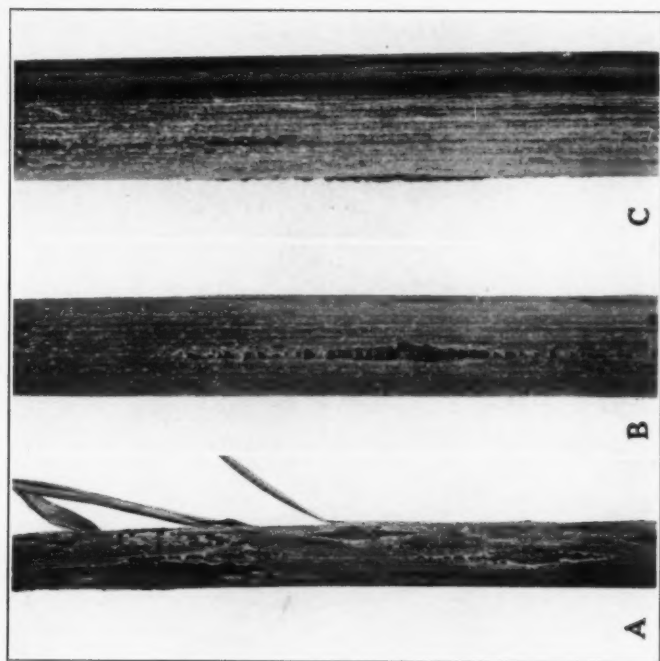
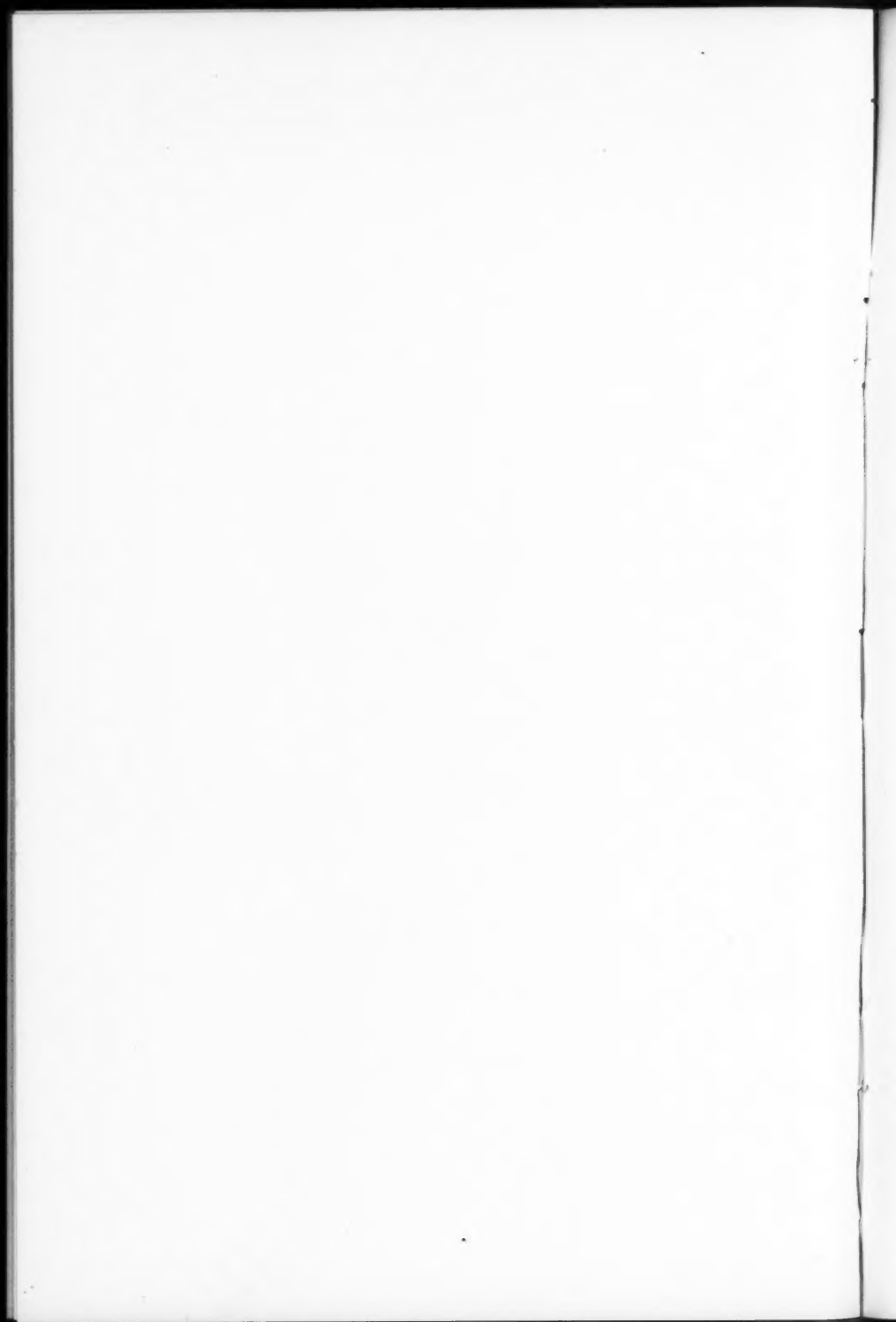


FIG. 2

PHYLLACHORA ROYSTONEAE JOHNSTON & BRUNER



NOTES AND BRIEF ARTICLES

Dr. J. F. Brenckle, of Kulm, North Dakota, an enthusiastic collector and frequent contributor to *Mycologia* has entered the United States service and at the present writing is located at the War Prison Hospital, Fort Douglas, Utah.

A long list of fungi collected on Long Island and Gardiner's Island appeared in *Torreya* for July, 1917, contributed by Stewart H. Burnham and Roy A. Latham.

Professor George F. Atkinson, of Cornell University, attended the Torrey Club Anniversary and remained at the Garden for some weeks consulting the mycological herbarium with special reference to the large numbers of types of gill-fungi which it contains.

An excellent edible mushroom, *Boletus luteus*, with tubes instead of gills, has become established under the young pine trees east and north of Conservatory Range 1. This was noticed last year, but the spawn has spread very considerably since that time.

In a pamphlet published in 1916 by the Indian Tea Association, A. C. Tunstall describes and gives treatment for root diseases of the tea plant caused by *Diplodia*, *Rosellinia*, *Hymenochaete noxia*, *Fomes lucidus*, *Ustulina zonata*, and *Thyridaria tarda*.

A needle blight of Douglas fir is described by J. R. Weir in the *Journal of Agricultural Research* for July. The disease has been found throughout the Northwest. The identity of the fungus has not been determined, but it apparently belongs to the Stictidaceae.

Black rootrot, a destructive disease to apple trees in Virginia, has been attributed by F. D. Fromme and H. E. Thomas largely to the work of the fungus *Xylaria Hypoxylon*. There is also

some evidence that other species of the genus may also be slightly pathogenic.

Endrot of cranberries is claimed by C. L. Shear to be caused by a sphaeropsidaceous fungus, which is described by him under the name of *Fusicoccum putrefaciens* and is suspected of being the pycnidial form of a *Cenangium* resembling *Cenangium urceolatum*.

The perfect stage of *Glocosporium venetum*, a fungus causing a disease of raspberries, is described in *Phytopathology* by W. H. Burkholder as *Plectodiscella veneta*. The fungus appears to belong to the *Myriangaceae*.

An article on the Taxonomy of the Agaricaceae, by William A. Murrill, which appeared in the *American Journal of Botany* for June, 1917, contains notes on collecting, preserving, and arranging fleshy or other bulky fungi in the herbarium.

A very useful condensed list of rose pests and their treatment may be found in the first number of the *Journal of the International Garden Club*, published in August, 1917. This number also contains some general notes on sprays and washes for decorative plants.

Dr. C. H. Kauffman, who is preparing manuscript on certain genera of the gill-fungi for *North American Flora*, spent a very successful vacation in the Rocky Mountains, where he made large collections of *Cortinarius*. He is now on leave for a year from the University of Michigan and is connected with the Federal Horticultural Board, with headquarters in Washington.

Para rubber trees in the Federated Malay States have recently been subject to attack by *Ustilina zonata*, which causes a dry-rot disease of the collar and root of this tree. It is suggested that diseased portions and wounds should be thoroughly cleaned and covered with some preservative.

The pink disease of cacao, according to J. B. Rorer, is caused wherever found by *Corticium salmonicolor*, which occurs in the

Orient on 141 different plants. In case of scattered infections, removal of diseased wood is said to be effective; but where the fungus has become established it is necessary to treat with tar.

The Commission of Plant Sanitation of Cuba has recently published its first bulletin, giving an account of its organization and work. This bulletin contains a list of plant diseases in Cuba; the budrot of the cocoanut and its control; and the banana disease and its control. Professor J. R. Johnston, who is president of the Commission and pathologist of the experiment station, has contributed most of the material for this bulletin.

A specimen of *Cycloporus Greenei* (Berk.) Murrill has recently been given to the Garden by Miss Eleanor Hodges, who collected it several years ago under rhododendrons at Pocono Manor, Pennsylvania. Miss Hodges knew that it was a rare fungus and was surprised to find it four or five times in different places in the vicinity of Pocono Manor. This interesting species is represented in the Garden herbarium by sporadic collections from New England to the mountains of North Carolina and west to Iowa, but Miss Hodges' collection is the first we have received from the state of Pennsylvania.

Since the completion of Volume 9 of *North American Flora*, many requests have come in for parts 1 and 2, dealing with the polypores, which were exhausted in separate several years ago. In order to supply the lack of these parts, Dr. Murrill published his series of books, entitled "Northern Polypores," "Southern Polypores," "Western Polypores," "Tropical Polypores," and "American Boletes." He is now preparing a small pamphlet containing the equivalents of his names in Saccardo's nomenclature, so that those using Saccardo's work may not be confused by the changes he has made. The pamphlet will appear in February, and may be obtained direct from the author for twenty cents by any reader of *Mycologia*.

A list of the Hymenomycetes of Rochester (New York) and vicinity, by Dr. Fred S. Boughton, has recently appeared in the

Proceedings of the Rochester Academy of Science. There are 319 species and varieties in the list, all collected by Mr. Boughton and most of them determined by Professor Peck. Interesting notes on occurrence, edibility, etc., are added. *Amanitopsis votvata* Peck is cited as an edible species, whereas Ford and others have found it to be poisonous. See *Mycologia* 6:174. 1914. *Amanita Frostiana* is probably harmless, but it too closely resembles *A. muscaria* to recommend it for food.

Polyporus amorphus Fries, which was referred to in *Mycologia* for January, 1916, and discussed quite fully in *Mycologia* for September, 1917, is represented in the Garden herbarium by two additional collections which have not been previously mentioned specifically. One is from Penobscot Lake, Somerset County, Maine, collected on decaying *Abies balsamea*, August 25, 1903, by E. R. Hodson, 187; and the other is from State College, Pennsylvania, collected on a stump of *Pinus Strobus*, November 27, 1914, by C. R. Orton and A. S. Rhoads, 14. The first mentioned collection appears to add a new host for America, the fungus having been reported hitherto on three species of pine, *P. rigida*, *P. Strobus*, and *P. pungens*, and on hemlock.

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